

Date 8/30/04 Serial # 10/603 306 Priority Application Date 6/25/2003  
Your Name Thanh Pham Examiner # 77023  
AU 2813 Phone 571-272-1696 Room Jeff 7C29  
In what format would you like your results? Paper is the default. ☒ PAPER ☐ DISK ☐ EMAIL

If submitting more than one search, please prioritize in order of need.

The EIC searcher normally will contact you before beginning a prior art search. If you would like to sit with a searcher for an interactive search, please notify one of the searchers.

Where have you searched so far on this case?

Circle:

☒ USPT

☒ DWPI

☒ EPO Abs

☒ IPO Abs

☐ IBM TDB

Other:

What relevant art have you found so far? Please attach pertinent citations or Information Disclosure Statements.

What types of references would you like? Please checkmark:

Primary Refs ☒

Secondary Refs ☒

Teaching Refs ☒

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Foreign Patents ☒

Other

What is the topic, such as the novelty, motivation, utility, or other specific facets defining the desired focus of this search? Please include the concepts, synonyms, keywords, acronyms, registry numbers, definitions, structures, strategies, and anything else that helps to describe the topic. Please attach a copy of the abstract and pertinent claims.

Examining directorate film of a single component  
(1205) 2 (Y 8) 1-30 by

ALD, ALE on atomic deposition

See above

| Staff Use Only                                  | Type of Search                                    | Vendors  |
|---|---|--|
| Searcher: <u>Scott Hartzog</u>                  | Structure (s) <input checked="" type="checkbox"/> | STN <input checked="" type="checkbox"/>            |
| Searcher Phone: <u>7-2663</u>                   | Bibliographic <input checked="" type="checkbox"/> | Indexing <input checked="" type="checkbox"/>       |
| Searcher Location: <u>STIC-EIC3800 JEF-4B68</u> | Litigation <input checked="" type="checkbox"/>    | Chemical/Other <input checked="" type="checkbox"/> |
| Date Searcher Picked Up: <u>8/30/04</u>         | Fulltext <input checked="" type="checkbox"/>      | Lexis-Nexis <input checked="" type="checkbox"/>    |
| Date Completed: <u>8/30/04</u>                  | Patent Family <input checked="" type="checkbox"/> | WWW/Internet <input checked="" type="checkbox"/>   |
| Searcher Prep/Rev Time: <u>30</u>               | Other <input checked="" type="checkbox"/>         | Other <input checked="" type="checkbox"/>          |
| Online Time: <u>90</u>                          |   |  |

BEST AVAILABLE COPY

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(FILE 'HOME' ENTERED AT 10:38:07 ON 30 AUG 2004)  
 SET ABB=ON PLU=ON  
 FILE 'ZCAPLUS' ENTERED AT 10:38:27 ON 30 AUG 2004

E ALD/CT  
 E E3+ALL/CT  
 E ATOMIC LAYER DEPOSITION/CT  
 E E4+ALL/CT

FILE 'INSPEC' ENTERED AT 10:47:18 ON 30 AUG 2004  
 E ATOMIC LAYER EPITAXIAL GROWTH+ALL/CT

L1 200285 S ("ATOMIC LAYER EPITAXIAL GROWTH" OR A6855 OR A8115G OR A8115H OR  
 B0520D OR B0520F OR E1520N)/CT  
 L2 2205 S ATOMIC LAYER EPITAXIAL GROWTH+NT/CT OR (L1 AND (ALD OR ALE OR ALCVD  
 OR ALG OR (ATOM##(A)LAYER?) (A) (GROW#### OR EPITAX##### OR  
 DEPOSIT?)))  
 L3 0 S (TA2O5 SS(S)Y2O3 SS)/CHI  
 L4 0 S (TA2O5 SS(L)Y2O3 SS)/CHI  
 L5 0 S (TA2O5 SS AND Y2O3 SS)/CHI  
 L6 17 S (TA2O5 AND Y2O3)/CHI  
 L7 0 S L6 AND L2  
 L8 136 S (TA SS(S)Y SS(S)O SS)/CHI  
 L9 0 S L2 AND L8  
 L10 149 S (TA(S)Y(S)O)/CHI  
 L11 0 S L2 AND L10  
 L12 2262 S ATOMIC LAYER EPITAXIAL GROWTH+NT/CT OR (L1  
 AND (ALD OR ALE OR ALCVD OR ALG OR ((ATOM## OR MOL OR AT OR  
 MOLECUL?) (A)LAYER?) (A) (GROW#### OR EPITAX##### OR DEPOSIT?)))  
 L13 0 S L10 AND L12  
 L14 0 S TA2O5 AND Y2O3 AND L12  
 L15 67 S (TA OR TANTAL? OR TA2O5) AND (YTTTRI? OR Y2O3 OR Y) AND L1  
 L16 0 S (TA OR TANTAL? OR TA2O5) AND (YTTTRI? OR Y2O3 OR Y) AND L12  
 L17 14 S L1 AND L8  
 L18 14 S L17 NOT PY>2003

FILE 'REGISTRY' ENTERED AT 10:58:49 ON 30 AUG 2004

L19 15 S O TA Y/ELF AND NC=1  
 L20 15 S O.TA.Y/MF AND NC=1

FILE 'HCAPLUS' ENTERED AT 10:58:55 ON 30 AUG 2004

L21 778 S ATOMIC LAYER EPITAXY+NT,UF/CT  
 L22 7995 S ALD OR ALE OR ALCVD OR ALG OR ((AT OR MOL  
 OR MOLECUL? OR ATOM##) (A)LAYER?) (A) (GROW#### OR EPITAX##### OR  
 DEPOSIT?)  
 L23 0 S (L19 OR L20) AND (L21 OR L22)  
 L24 0 S (TA OR TANTAL? OR TA2O5) AND (YTTTRI? OR  
 Y2O3 OR Y) AND L12  
 L25 11 S (TA OR TANTAL? OR TA2O5) AND (YTTTRI? OR  
 Y2O3 OR Y) AND (L21 OR L22)  
 L26 0 S L25 NOT P/DT NOT PY>2003  
 L27 11 S L25 AND P/DT

INDEX ENGINEERING ENTERED AT 11:01:03 ON 30 AUG 2004

L28 QUE (TA OR TANTAL? OR TA2O5) (2A) (YTTTRI? OR Y2O3 OR Y) AND L22

FILE 'WPIX, HCAPLUS, PCTFULL, PROMT, EUROPATFULL, FRFULL, INSPEC' ENTERED  
 AT 11:13:00 ON 30 AUG 2004

L29 80 S L28  
 SET DUPORDER FILE

ANSWERS '1-15' FROM FILE INSPEC  
ANSWERS '16-26' FROM FILE HCAPLUS  
ANSWERS '27-92' FROM FILE PCTFULL  
ANSWERS '93-98' FROM FILE PROMT  
ANSWERS '99-101' FROM FILE EUROPATFULL  
ANSWERS '102-103' FROM FILE FRFULL

INDEX ENGINEERING ENTERED AT 11:58:00 ON 30 AUG 2004  
L31 QUE (TA OR TANTAL? OR TA2O5) (2A) (YTTRI? OR Y2O3 OR Y) AND L22

FILE 'WPIX, HCAPLUS, PCTFULL, PROMT, EUROPATFULL, FRFULL, INSPEC' ENTERED  
AT 12:28:47 ON 30 AUG 2004  
L33 15 S L31 NOT L30

FILE 'WPIX, PCTFULL, EUROPATFULL' ENTERED AT 12:42:20 ON 30 AUG 2004  
L34 14 DUP REM L33 (1 DUPLICATE REMOVED)

FILE 'PCTFULL' ENTERED AT 13:37:54 ON 30 AUG 2004  
L35 66 S L30  
L36 6 S L34  
L37 66 S L30 NOT L34  
L38 684 S ((ATOM## OR MOL OR AT OR MOLECUL?) (A) LAYER?) (A) (GROW#### OR  
EPITAX#### OR DEPOSIT?)  
L39 3 S L37 AND L38  
L40 66 S L30  
L41 3 L40 AND L38  
L42 0 L41 NOT L39

☐ L30 ANSWER 1 OF 103 INSPEC (C) 2004 IEE on STN

## Accession Number

2004:7829346 INSPEC DN A2004-04-6865-025; B2004-02-2810-020 [Full Text](#)

## Title

***Effects of La-doping on crystallinity and dielectric properties of SrAl<sub>0.5</sub>Ta<sub>0.5</sub>O<sub>3</sub> thin films for high-T<sub>c</sub> superconductor multilayer structure.***

## Author/Inventor

Takahashi, Y.; Wakana, H.; Ogawa, A.; Morishita, T.; Tanabe, K. (Supercond. Res. Lab., ISTECH, Tokyo, Japan)

## Source

Physica C (Oct. 2003) vol.392-396, pt.2, p.1337-41. 11 refs. Published by: Elsevier Price: CCCC 0921-4534/03/\$30.00 CODEN: PHYCE6 ISSN: 0921-4534 SICI: 0921-4534(200310)392/396:2L:1337:EDCD;1-D Conference: 15th International Symposium on Superconductivity (ISS 2002) Advances in Superconductivity. Yokohama, Japan, 11-13 Nov 2002 Sponsor(s): Int. Superconductivity Technol. Center

## Abstract

La<sub>x</sub>Sr<sub>1-x</sub>Al<sub>0.5</sub>Ta<sub>0.5</sub>O<sub>3</sub> (La-SAT) thin films were prepared to examine the effects of La-doping to SrAl<sub>0.5</sub>Ta<sub>0.5</sub>O<sub>3</sub> (SAT) as intermediate insulating films for high-T<sub>c</sub> devices. 300-nm-thick La-SAT films were grown on approximately 10- $\mu$ m-thick YBa<sub>2</sub>Cu<sub>3</sub>O<sub>7- $\delta$</sub>  (YBCO) films by metalorganic chemical vapor deposition with the La-doping ratio x of 0-0.2. The La-SAT films with x $\leq$ 0.1 exhibited good crystallinity and monotonic lattice contraction with increasing x. 300-nm-thick La<sub>0.2</sub>Y<sub>0.9</sub>Ba<sub>1.9</sub>Cu<sub>3</sub>O<sub>7- $\delta$</sub>  (La-YBCO) films deposited on these La-SAT films had good T<sub>c</sub> and J<sub>c</sub> values comparable to those for the SAT films without La-doping. On the other hand, the La-SAT film with x approximately=0.2 changed to have random orientation and a La-YBCO film on the La-SAT film showed much poorer T<sub>c</sub> and J<sub>c</sub> values. These results suggest that the La solubility limit to SAT exists in the range of x=0.1-0.2, although a monotonic decrease in the dielectric constant with increasing x was observed for all the La-SAT films in the x range of 0-0.2 and low conductance less than 10<sup>-6</sup> S.

## Concept or Classification

A6865 Low-dimensional structures: growth, structure and nonelectronic properties; A7720 Dielectric permittivity; **A8115H Chemical vapour deposition**; A7470V Perovskite phase superconductors; A7410 Superconducting critical temperature, occurrence; B2810 Dielectric materials and properties; **B0520F Chemical vapour deposition**; B3220H High-temperature superconducting materials CHI  
**LaSrAl<sub>0.5</sub>Ta<sub>0.5</sub>O<sub>3</sub>-YBa<sub>2</sub>Cu<sub>3</sub>O<sub>7</sub> int, LaSrAl<sub>0.5</sub>Ta<sub>0.5</sub>O<sub>3</sub> int, YBa<sub>2</sub>Cu<sub>3</sub>O<sub>7</sub> int, Al<sub>0.5</sub> int, Ta<sub>0.5</sub> int, Ba<sub>2</sub> int, Cu<sub>3</sub> int, Al int, Ba int, Cu int, La int, O<sub>3</sub> int, O<sub>7</sub> int, Sr int, Ta int, O int, Y int, LaSrAl<sub>0.5</sub>Ta<sub>0.5</sub>O<sub>3</sub> ss, YBa<sub>2</sub>Cu<sub>3</sub>O<sub>7</sub> ss, Al<sub>0.5</sub> ss, Ta<sub>0.5</sub> ss, Ba<sub>2</sub> ss, Cu<sub>3</sub> ss, Al ss, Ba ss, Cu ss, La ss, O<sub>3</sub> ss, O<sub>7</sub> ss, Sr ss, Ta ss, O ss, Y ss**

☐ L30 ANSWER 2 OF 103 INSPEC (C) 2004 IEE on STN

## Accession Number

2003:7636374 INSPEC DN A2003-13-7720-031; B2003-06-2810F-186 [Full Text](#)

## Title

***Studies of thin film ferroelectrics with charge-compensated substitutions in BST.***

## Author/Inventor

Potrepka, D.; Tidrow, S.; Tauber, A.; Kirchner, K.; Rod, B. (Sensors &amp; Electron Devices Directorate, US Army Res. Lab., Adelphi, MD, USA); Horwitz, J.; Wontae Chang; Navi, N.; Bubb, D.

## Source

Materials Issues for Tunable RF and Microwave Devices III. Symposium (Materials

Research Society Symposium Proceedings Vol.720) Editor(s): Tidrow, S.C.; Horwitz, J.S.; Xi, X.; Levy, J. Warrendale, PA, USA: Mater. Res. Soc, 2002. p.175-8 of ix+211 pp. 4 refs. Conference: San Francisco, CA, USA, 2-3 April 2002 ISBN: 1-55899-656-7

**Abstract**

Thin films were prepared from bulk targets by pulsed-laser deposition techniques. The targets were composed of Ba<sub>0.6</sub>Sr<sub>0.4</sub>TiO<sub>3</sub> with charge-compensated substitutions for Ti<sup>4+</sup>. Results of the dielectric characterization measurements will be discussed and compared to the results of similar measurements in bulk materials with the same composition.

**Concept or Classification**

A7720 Dielectric permittivity; A7755 Dielectric thin films; A6855 *Thin film growth, structure, and epitaxy*; A6160 Crystal structure of specific inorganic compounds; B2810F Piezoelectric and ferroelectric materials CHI *Ba<sub>0.6</sub>Sr<sub>0.4</sub>YTaTiO<sub>3</sub> ss, Ba<sub>0.6</sub> ss, Sr<sub>0.4</sub> ss, TiO<sub>3</sub> ss, Ba ss, O<sub>3</sub> ss, Sr ss, Ta ss, Ti ss, O ss, Y ss*; MgO sur, Mg sur, O sur, MgO bin, Mg bin, O bin

☐ **L30 ANSWER 3 OF 103 INSPEC (C) 2004 IEE on STN****Accession Number**

1999:6320559 INSPEC DN B1999-09-2860F-006 [Full Text](#)

**Title**

*Metal/ferroelectric/insulator/semiconductor structure of Pt/SrBi<sub>2</sub>Ta<sub>2</sub>O<sub>9</sub>/YMnO<sub>3</sub>/Si using YMnO<sub>3</sub> as the buffer layer.*

**Author/Inventor**

Kyu-Jeong Choi; Woong-Chul Shin; Jung-Hwan Yang; Soon-Gil Yoon (Dept. of Mater. Eng., Chungnam Nat. Univ., Taejon, South Korea)

**Source**

Applied Physics Letters (2 Aug. 1999) vol.75, no.5, p.722-4. 11 refs. Doc. No.: S0003-6951(99)04231-X Published by: AIP Price: CCCC 0003-6951/99/75(5)/722(3)/\$15.00 CODEN: APPLAB ISSN: 0003-6951 SICI: 0003-6951(19990802)75:5L:722:MFIS;1-R

**Abstract**

The ferroelectric SrBi<sub>2</sub>Ta<sub>2</sub>O<sub>9</sub> (SBT) and YMnO<sub>3</sub> buffer layers for the metal/ferroelectric/insulator/semiconductor (MFIS) structure were deposited using pulsed-laser ablation and metalorganic chemical vapor deposition, respectively. Memory windows of the MFIS structure were in the range of 0.3-1.5 V when the gate voltage varied from 2 to 6 V. There were no reactions between ferroelectric SBT and Si in the MFIS structure annealed at 900 degrees C. The YMnO<sub>3</sub> buffer layer plays an important role in alleviating the interdiffusion between elements of SBT and Si. The proposed MFIS structure of Pt/200 nm-SBT/25 nm-YMnO<sub>3</sub>/Si is attractive for nondestructive read-out ferroelectric random access memory applications.

**Concept or Classification**

B2860F Ferroelectric devices; B2530F Metal-insulator-semiconductor structures; B2810F Piezoelectric and ferroelectric materials; B0520H Pulsed laser deposition; B0520F *Chemical vapour deposition*; B2550A Annealing processes in semiconductor technology; B1265D Memory circuits; B2560R Insulated gate field effect transistors CHI *Pt-SrBi<sub>2</sub>Ta<sub>2</sub>O<sub>9</sub>-YMnO<sub>3</sub>-Si int, SrBi<sub>2</sub>Ta<sub>2</sub>O<sub>9</sub> int, YMnO<sub>3</sub> int, Bi<sub>2</sub> int, Ta<sub>2</sub> int, Bi int, Mn int, O<sub>3</sub> int, O<sub>9</sub> int, Pt int, Si int, Sr int, Ta int, O int, Y int, SrBi<sub>2</sub>Ta<sub>2</sub>O<sub>9</sub> ss, YMnO<sub>3</sub> ss, Bi<sub>2</sub> ss, Ta<sub>2</sub> ss, Bi ss, Mn ss, O<sub>3</sub> ss, O<sub>9</sub> ss, Sr ss, Ta ss, O ss, Y ss, Pt el, Si el*

☐ **L30 ANSWER 4 OF 103 INSPEC (C) 2004 IEE on STN****Accession Number**

1999:6233893 INSPEC DN A1999-11-8140N-026 [Full Text](#)

**Title**

***Mechanism of spallation in platinum aluminide/electron beam physical vapor-deposited thermal barrier coatings.***

**Author/Inventor**

Gell, M.; Vaidyanathan, K. (Dept. of Metall. & Mater. Eng., Connecticut Univ., Storrs, CT, USA); Barber, B.; Jiangtian Cheng; Jordon, E.

**Source**

Metallurgical and Materials Transactions A (Physical Metallurgy and Materials Science) (Feb. 1999) vol.30A, no.2, p.427-35. 10 refs. Published by: Minerals, Metals & Mater. Soc. & ASM Int Price: CCCC 1073-5623/99/\$8.00 CODEN: MTTABN ISSN: 1073-5623 SICI: 1073-5623(199902)30A:2L:427:MSPA;1-L Conference: Symposium on Fatigue and Creep of Composite Materials.

**Abstract**

The spallation failure of a commercial thermal barrier coating (TBC), consisting of a single-crystal RENE N5 superalloy, a platinum aluminide (Pt-Al) bond coat, and an electron beam-deposited 7 wt pct yttria-stabilized zirconia ceramic layer (7YSZ), was studied following cyclic furnace testing. In the uncycled state and prior to deposition of the ceramic, the Pt-Al bond-coat surface contains a cellular network of ridges corresponding to the underlying bond-coat grain-boundary structure. With thermal cycling, the ridges and associated grain boundaries are the sites of preferential oxidation and cracking, which results in the formation of cavities that are partially filled with oxide. Using a fluorescent penetrant dye in conjunction with a direct-pull test, it is shown that, when specimens are cycled to about 80 pct of life, these grain-boundary regions show extensive debonding. The roles of oxidation and cyclic stress in localized grain boundary region spallation are discussed. The additional factors leading to large-scale TBC spallation are described.

**Concept or Classification**

A8140N Fatigue, embrittlement, and fracture; A8160B Surface treatment and degradation of metals and alloys; A6855 *Thin film growth, structure, and epitaxy*; A8115G *Vacuum deposition*; A6170N Grain and twin boundaries; A8190 Other topics in materials science; A6220M Fatigue, brittleness, fracture, and cracks CHI NiCoCrTaAlW sur, Al sur, Co sur, Cr sur, Ni sur, Ta sur, W sur, NiCoCrTaAlW ss, Al ss, Co ss, Cr ss, Ni ss, Ta ss, W ss; NiCoCrTaAlW-PtAl-ZrO<sub>2</sub>Y<sub>2</sub>O<sub>3</sub> int, NiCoCrTaAlW int, ZrO<sub>2</sub>Y<sub>2</sub>O<sub>3</sub> int, PtAl int, Al int, Co int, Cr int, Ni int, O<sub>2</sub> int, O<sub>3</sub> int, Pt int, Ta int, Y<sub>2</sub> int, Zr int, O int, W int, Y int, NiCoCrTaAlW ss, ZrO<sub>2</sub>Y<sub>2</sub>O<sub>3</sub> ss, Al ss, Co ss, Cr ss, Ni ss, O<sub>2</sub> ss, O<sub>3</sub> ss, Ta ss, Y<sub>2</sub> ss, Zr ss, O ss, W ss, Y ss, PtAl bin, Al bin, Pt bin

☐ **L30 ANSWER 5 OF 103 INSPEC (C) 2004 IEE on STN**

**Accession Number**

1999:6303414 INSPEC DN A1999-17-8115C-002 [Full Text](#)

**Title**

***Thermal stability of Al-O-N PVD films and comparison with Al<sub>2</sub>O<sub>3</sub> films as diffusion barriers.***

**Author/Inventor**

Reichert, K. (Lehrstuhl fur Theor. Huttenkunde, Tech. Hochschule Aachen, Germany)

**Source**

Surface Engineering (1999) vol.15, no.2, p.163-7. 14 refs. Published by: Inst. Mater CODEN: SUENET ISSN: 0267-0844 SICI: 0267-0844(1999)15:2L:163:TSFC;1-1

**Abstract**

The use of Al-O-N films as diffusion barriers for components with a high thermal load, e.g. in gas turbines, was investigated. Films with compositions along the quasibinary section Al<sub>2</sub>O<sub>3</sub>-AlN were deposited onto Ni based superalloy (CMSX-4) substrates by means of magnetron sputtering ion plating at 373 K substrate temperature and characterised with regard to their composition and structure

using X-ray photoelectron spectroscopy and grazing incidence XRD. The phase stability of the films was examined by annealing under inert atmosphere at temperatures up to 1473 K for 4 h and by subsequent XRD analyses. To investigate the possible application of these films as a diffusion barrier between Ni based superalloys and MCrAlY, with the latter serving in technical applications as corrosion protection for superalloys, an NiCoCrAlY coating was deposited onto selected specimens. Without a diffusion barrier and operating temperatures of and above 1373 K, noticeable interdiffusion was observed. After annealing the CMSX-4/Al-O-N/NiCoCrAlY composites for 4 h, the CMSX-4/Al-O-N and Al-O-N/NiCoCrAlY interfaces were investigated by XRD and energy dispersive X-ray spectroscopy. The analyses showed that interdiffusion between CMSX-4 and NiCoCrAlY was observed in the case of the Al<sub>2</sub>O<sub>3</sub> during annealing, and was especially evident in titanium. In contrast to this, ternary Al-O-N films showed better performance as diffusion barriers, i.e. no titanium was detectable in the Al-O-N or NiCoCrAlY film. A possible explanation is that the ternary films were grown in an amorphous structure and remained in that state after annealing the CMSX-4/Al-O-N/NiCoCrAlY composites, whereas Al<sub>2</sub>O<sub>3</sub>, which at the low substrate temperature was supposedly deposited nanocrystalline in the cubic gamma-Al<sub>2</sub>O<sub>3</sub> structure, converted into the hexagonal alpha modification. This transition is assumed to be responsible for the permeability of interdiffusing elements.

#### Concept or Classification

A8115C Deposition by sputtering; *A6855 Thin film growth, structure, and epitaxy*; A8160B Surface treatment and degradation of metals and alloys; A8140G Other heat and thermomechanical treatments; A6630N Chemical interdiffusion in solids; A8115J Ion plating and other vapour deposition; A7960G Photoelectron spectra of composite surfaces CHI AlON ss, Al ss, N ss, O ss; NiCoCrAlY sur, Al sur, Co sur, Cr sur, Ni sur, Y sur, NiCoCrAlY ss, Al ss, Co ss, Cr ss, Ni ss, Y ss; NiCoCrTaWAl sur, Al sur, Co sur, Cr sur, Ni sur, Ta sur, W sur, NiCoCrTaWAl ss, Al ss, Co ss, Cr ss, Ni ss, Ta ss, W ss; AlON-NiCoCrAlY int, NiCoCrAlY int, AlON int, Al int, Co int, Cr int, Ni int, N int, O int, Y int, NiCoCrAlY ss, AlON ss, Al ss, Co ss, Cr ss, Ni ss, N ss, O ss, Y ss; *NiCoCrTaWAlALONNiCoCrAlY ss, Al ss, Co ss, Cr ss, Ni ss, Ta ss, N ss, O ss, W ss, Y ss*

#### ☐ L30 ANSWER 6 OF 103 INSPEC (C) 2004 IEE on STN

##### Accession Number

1999:6344242 INSPEC DN A1999-20-8160B-043 [Full Text](#)

##### Title

***Mechanical properties and fracture behavior of interfacial alumina scales on plasma-sprayed thermal barrier coatings.***

##### Author/Inventor

Haynes, J.A.; Ferber, M.K.; Porter, W.D. (Lab. of High Temp. Mater., Oak Ridge Nat. Lab., TN, USA); Rigney, E.D.

##### Source

Materials at High Temperatures (1999) vol.16, no.2, p.49-69. 51 refs. Published by: Science and Technology Letters Price: CCCC 0960-3409/99/\$10.00 CODEN: MHTEEM ISSN: 0960-3409 SICI: 0960-3409(1999)16:2L:49:MPFB;1-9

##### Abstract

The mechanical properties and fracture behavior of Y-doped Al<sub>2</sub>O<sub>3</sub> scales were investigated by furnace thermal cycling (to 1,150 degrees C) of plasma-sprayed thermal barrier coatings (TBCs) with vacuum plasma-sprayed (VPS) or air plasma-sprayed (APS) Ni-22Cr-10Al-1Y bond coatings. No significant alterations in Al<sub>2</sub>O<sub>3</sub> hardness or Young's modulus (as measured by mechanical properties microprobe) were detected as a function of bond coat type, exposure time, or number of thermal cycles. The interfacial Al<sub>2</sub>O<sub>3</sub> scales on VPS NiCrAlY exhibited progressive increases in localized fracture, buckling, and delamination during thermal cycling. The concentration of arrayed lenticular voids in the columnar Al<sub>2</sub>O<sub>3</sub> grain boundaries significantly increased during cyclic oxidation (as

compared to isothermal oxidation), but only in scales which formed on convex surfaces, suggesting internal void growth was stress-related. The amount and frequency of scale damage was higher on convex surfaces with a relatively large radius of curvature as compared to convex surfaces with a very small radius of curvature. Although the thermomechanical fracture resistance of Al<sub>2</sub>O<sub>3</sub> scales on APS NiCrAlY was superior to scales on VPS NiCrAlY, TBC lifetimes on VPS NiCrAlY were greater by a factor of 2. Apparently, severe interfacial scale damage did not rapidly degrade the adherence of the ceramic top coatings.

#### Concept or Classification

A8160B Surface treatment and degradation of metals and alloys; A8115R Spray coating techniques; **A6855 Thin film growth, structure, and epitaxy**; A6860 Physical properties of thin films, nonelectronic; A8140N Fatigue, embrittlement, and fracture; A6220M Fatigue, brittleness, fracture, and cracks; A8140J Elasticity and anelasticity; A6220D Elasticity, elastic constants; A6170N Grain and twin boundaries; A6170Q Inclusions and voids CHI *NiCoCrAlTaWReMo-NiCrAlY-Al<sub>2</sub>O<sub>3</sub>Y int, NiCoCrAlTaWReMo int, NiCrAlY int, Al<sub>2</sub>O<sub>3</sub>Y int, Al<sub>2</sub>O<sub>3</sub> int, Al<sub>2</sub> int, Al int, Co int, Cr int, Mo int, Ni int, O<sub>3</sub> int, Re int, Ta int, O int, W int, Y int, NiCoCrAlTaWReMo ss, NiCrAlY ss, Al<sub>2</sub>O<sub>3</sub>Y ss, Al<sub>2</sub>O<sub>3</sub> ss, Al<sub>2</sub> ss, Al ss, Co ss, Cr ss, Mo ss, Ni ss, O<sub>3</sub> ss, Re ss, Ta ss, O ss, W ss, Y ss*; NiCoCrAlTaWReMo sur, Al sur, Co sur, Cr sur, Mo sur, Ni sur, Re sur, Ta sur, W sur, NiCoCrAlTaWReMo ss, Al ss, Co ss, Cr ss, Mo ss, Ni ss, Re ss, Ta ss, W ss

#### ☐ L30 ANSWER 7 OF 103 INSPEC (C) 2004 FIZ KARLSRUHE on STN

##### Accession Number

1998:5840161 INSPEC DN A9807-7475-007 [Full Text](#)

##### Title

***Epitaxial ferroelectric/superconductor heterostructures.***

##### Author/Inventor

Boikov, Yu.A.; Ivanov, Z.G.; Olsson, E.; Claeson, T. (Dept. of Phys., Chalmers Univ. of Technol., Goteborg, Sweden)

##### Source

Physica C (Aug. 1997) vol.282-287, p.111-4, pt.1. 6 refs. Doc. No.: S0921-4534(97)00231-1 Published by: Elsevier Price: CCCC 0921-4534/97/\$17.00 CODEN: PHYCE6 ISSN: 0921-4534 SICI: 0921-4534(199708)282/287L:111:EFSh;1-V Conference: International Conference on Materials and Mechanisms of Superconductivity High Temperature Superconductors V. Beijing, China, 28 Feb-4 March 1997

##### Abstract

The growth, structure and dielectric parameters of epitaxial multilayers of superconducting and polarizable dielectric films grown by pulsed laser deposition were investigated: SrTiO<sub>3</sub>/YBa<sub>2</sub>Cu<sub>3</sub>O<sub>7-δ</sub>, KTaO<sub>3</sub>/YBa<sub>2</sub>Cu<sub>3</sub>O<sub>7-δ</sub>, PbZr<sub>0.1</sub>Ti<sub>0.9</sub>O<sub>3</sub>/YBa<sub>2</sub>Cu<sub>3</sub>O<sub>7-δ</sub> and SrBi<sub>2</sub>Nb<sub>2</sub>O<sub>9</sub>/YBa<sub>2</sub>Cu<sub>3</sub>O<sub>7-δ</sub>.

#### Concept or Classification

A7475 Superconducting films; A6480G Microstructure; A6848 Solid-solid interfaces; **A6855 Thin film growth, structure, and epitaxy**; A7470V Perovskite phase superconductors; A7720 Dielectric permittivity; A7740 Dielectric loss and relaxation; A7755 Dielectric thin films; A8115I Pulsed laser deposition; A7780 Ferroelectricity and antiferroelectricity CHI *SrTiO<sub>3</sub>-YBa<sub>2</sub>Cu<sub>3</sub>O<sub>7</sub> int, YBa<sub>2</sub>Cu<sub>3</sub>O<sub>7</sub> int, SrTiO<sub>3</sub> int, TiO<sub>3</sub> int, Ba<sub>2</sub> int, Cu<sub>3</sub> int, Ba int, Cu int, O<sub>3</sub> int, O<sub>7</sub> int, Sr int, Ti int, O int, Y int, YBa<sub>2</sub>Cu<sub>3</sub>O<sub>7</sub> ss, SrTiO<sub>3</sub> ss, TiO<sub>3</sub> ss, Ba<sub>2</sub> ss, Cu<sub>3</sub> ss, Ba ss, Cu ss, O<sub>3</sub> ss, O<sub>7</sub> ss, Sr ss, Ti ss, O ss, Y ss*; *KTaO<sub>3</sub>-YBa<sub>2</sub>Cu<sub>3</sub>O<sub>7</sub> int, YBa<sub>2</sub>Cu<sub>3</sub>O<sub>7</sub> int, KTaO<sub>3</sub> int, TaO<sub>3</sub> int, Ba<sub>2</sub> int, Cu<sub>3</sub> int, Ba int, Cu int, O<sub>3</sub> int, O<sub>7</sub> int, Ta int, K int, O int, Y int, YBa<sub>2</sub>Cu<sub>3</sub>O<sub>7</sub> ss, KTaO<sub>3</sub> ss, TaO<sub>3</sub> ss, Ba<sub>2</sub> ss, Cu<sub>3</sub> ss, Ba ss, Cu ss, O<sub>3</sub> ss, O<sub>7</sub> ss, Ta ss, K ss, O ss, Y ss*; *PbTiO<sub>3</sub>:Zr-YBa<sub>2</sub>Cu<sub>3</sub>O<sub>7</sub> int, PbTiO<sub>3</sub>:Zr int, YBa<sub>2</sub>Cu<sub>3</sub>O<sub>7</sub> int, PbTiO<sub>3</sub> int, TiO<sub>3</sub> int, Ba<sub>2</sub> int, Cu<sub>3</sub> int, Ba int, Cu int, O<sub>3</sub> int, O<sub>7</sub> int, Pb int, Ti int, Zr int, O int, Y int, PbTiO<sub>3</sub>:Zr ss, YBa<sub>2</sub>Cu<sub>3</sub>O<sub>7</sub> ss, PbTiO<sub>3</sub> ss, TiO<sub>3</sub> ss, Ba<sub>2</sub> ss, Cu<sub>3</sub> ss, Ba ss, Cu ss, O<sub>3</sub> ss, O<sub>7</sub> ss, Pb ss, Ti ss, Zr ss, O ss, Y ss, Zr el, Zr dop; SrBi<sub>2</sub>Nb<sub>2</sub>O<sub>9</sub>-YBa<sub>2</sub>Cu<sub>3</sub>O<sub>7</sub> int, SrBi<sub>2</sub>Nb<sub>2</sub>O<sub>9</sub> int, YBa<sub>2</sub>Cu<sub>3</sub>O<sub>7</sub> int, Ba<sub>2</sub> int, Bi<sub>2</sub> int, Cu<sub>3</sub> int, Nb<sub>2</sub> int, Ba int, Bi int, Cu int, Nb int, O<sub>7</sub> int, O<sub>9</sub> int, Sr int, O int, Y int, SrBi<sub>2</sub>Nb<sub>2</sub>O<sub>9</sub> ss, YBa<sub>2</sub>Cu<sub>3</sub>O<sub>7</sub> ss, Ba<sub>2</sub> ss, Bi<sub>2</sub> ss, Cu<sub>3</sub> ss, Nb<sub>2</sub> ss, Ba ss, Bi ss, Cu ss, Nb ss, O<sub>7</sub> ss, O<sub>9</sub> ss, Sr ss, O ss, Y ss*



☐ L30 ANSWER 8 OF 103 INSPEC (C) 2004 IEE on STN

## Accession Number

1996:5323610 INSPEC DN A9616-6822-023 [Full Text](#)

## Title

***Oxygen diffusion coefficients for Sr<sub>2</sub>AlTaO<sub>6</sub>: ramifications on HTSC multilayer processing.***

## Author/Inventor

Tidrow, S.C.; Lareau, R.T. (US Army Res. Lab., AMSRL-PS-PC, Fort Monmouth, NJ, USA); King, L.L.H.; Eckart, D.W.; Tauber, A.; Wilber, W.D.; Pfeffer, R.L.; Finnegan, R.D.; Neal, M.

## Source

Epitaxial Oxide Thin Films II. Symposium Editor(s): Speck, J.S.; Fork, D.K.; Wolf, R.M.; Shiosaki, T. Pittsburgh, PA, USA: Mater. Res. Soc, 1996. p.363-8 of xv+562 pp. 23 refs. Conference: Boston, MA, USA, 26-30 Nov 1995

## Abstract

We have studied the rate of oxygen diffusion through Sr<sub>2</sub>AlTaO<sub>6</sub> (SAT), a buffer and dielectric layer used in high critical temperature superconducting (HTSC) structures. An epitaxial bilayer film of SAT on YBa<sub>2</sub>Cu<sub>3</sub>O<sub>7-δ</sub> (YBCO) was deposited onto an (001) oriented single crystal LaAlO<sub>3</sub> substrate using the pulsed laser deposition technique. The rate of oxygen diffusion through the bilayer was investigated over the temperature range 415 to 675 degrees C by post deposition annealing individual sections of the bilayer in 1/3 atm of 18O enriched molecular oxygen gas. Secondary ion mass spectroscopy was used to depth profile 18O and 16O in each sample. Oxygen diffusion coefficients for SAT at 418, 510, 570 and 673 degrees C were determined to be roughly (0.93, 6.31, 26.6 and 75.3)\*10<sup>-16</sup> cm<sup>2</sup> s<sup>-1</sup>, respectively. Since these diffusion rates can limit oxygen intake into underlying YBCO films, SAT may be an inappropriate choice as a dielectric candidate for use in an HTSC multilayer device technology and will at best require development of suitable post annealing schemes to oxygenate underlying YBCO layers.

## Concept or Classification

A6822 Surface diffusion, segregation and interfacial compound formation; A6630N Chemical interdiffusion in solids; A7470V Perovskite phase superconductors; A7475 Superconducting films; A8280M Mass spectrometry (chemical analysis); A6855 *Thin film growth, structure, and epitaxy*; A7450 Superconductor tunnelling phenomena, proximity effects, and Josephson effect; A7470J Superconducting layer structures and intercalation compounds; A7920N Atom-, molecule-, and ion-surface impact; A8115I Pulsed laser deposition CHI LaAlO<sub>3</sub> sur, Al sur, La sur, O<sub>3</sub> sur, O sur, LaAlO<sub>3</sub> ss, Al ss, La ss, O<sub>3</sub> ss, O ss; YBa<sub>2</sub>Cu<sub>3</sub>O-Sr<sub>2</sub>AlTaO<sub>6</sub>-LaAlO<sub>3</sub> int, Sr<sub>2</sub>AlTaO<sub>6</sub> int, YBa<sub>2</sub>Cu<sub>3</sub>O int, LaAlO<sub>3</sub> int, Ba<sub>2</sub> int, Cu<sub>3</sub> int, Sr<sub>2</sub> int, Al int, Ba int, Cu int, La int, O<sub>3</sub> int, O<sub>6</sub> int, Sr int, Ta int, O int, Y int, Sr<sub>2</sub>AlTaO<sub>6</sub> ss, YBa<sub>2</sub>Cu<sub>3</sub>O ss, LaAlO<sub>3</sub> ss, Ba<sub>2</sub> ss, Cu<sub>3</sub> ss, Sr<sub>2</sub> ss, Al ss, Ba ss, Cu ss, La ss, O<sub>3</sub> ss, O<sub>6</sub> ss, Sr ss, Ta ss, O ss, Y ss

☐ L30 ANSWER 9 OF 103 INSPEC (C) 2004 IEE on STN

## Accession Number

1995:5035587 INSPEC DN A9519-8115I-004 [Full Text](#)

## Title

***Epitaxial Sr<sub>2</sub>(AlTa)O<sub>6</sub> films as buffer layers on MgO for YBa<sub>2</sub>Cu<sub>3</sub>O<sub>7-x</sub> thin film growth.***

## Author/Inventor

Chen, K.Y.; Afonso, S.; Wang, R.C.; Tang, Y.Q.; Salamo, G.; Chan, F.T. (Dept. of Phys., Arkansas Univ., Fayetteville, AR, USA); Guo, R.; Bhalla, A.S.

## Source

Journal of Applied Physics (1 Aug. 1995) vol.78, no.3, p.2138-40. 9 refs. Price:

CCCC 0021-8979/95/78(3)/2138/3/\$6.00 CODEN: JAPIAU ISSN: 0021-8979

**Abstract**

Sr<sub>2</sub>(AlTa)O<sub>6</sub> thin films (2000-3000 Å) have been deposited on MgO (001) substrates using pulsed laser deposition (PLD). X-ray-diffraction analysis shows that the Sr<sub>2</sub>(AlTa)O<sub>6</sub> grows with the c axis highly oriented normal to the substrate plane and very good in-plane epitaxy. The subsequently deposited YBa<sub>2</sub>Cu<sub>3</sub>O<sub>7-x</sub> films using PLD on Sr<sub>2</sub>(AlTa)O<sub>6</sub> buffered MgO substrates exhibit excellent epitaxial growth with a narrow rocking curve width and a small  $\phi$  scan peak width. The critical temperature T<sub>c0</sub> of 90-92 K has been achieved reproducibly and the critical current density is over 2.7\*10<sup>6</sup> A/cm<sup>2</sup> at 77 K.

**Concept or Classification**

A8115I Pulsed laser deposition; A6855 *Thin film growth, structure, and epitaxy*; A7470V Perovskite phase superconductors; A7475 Superconducting films; A7410 Superconducting critical temperature, occurrence; A7460J Critical currents in type-II superconductors CHI YBa<sub>2</sub>Cu<sub>3</sub>O<sub>7</sub>-Sr<sub>2</sub>AlTaO<sub>6</sub>-MgO int, Sr<sub>2</sub>AlTaO<sub>6</sub> int, YBa<sub>2</sub>Cu<sub>3</sub>O<sub>7</sub> int, Ba<sub>2</sub> int, Cu<sub>3</sub> int, MgO int, Sr<sub>2</sub> int, Al int, Ba int, Cu int, Mg int, O<sub>6</sub> int, O<sub>7</sub> int, Sr int, Ta int, O int, Y int, Sr<sub>2</sub>AlTaO<sub>6</sub> ss, YBa<sub>2</sub>Cu<sub>3</sub>O<sub>7</sub> ss, Ba<sub>2</sub> ss, Cu<sub>3</sub> ss, Sr<sub>2</sub> ss, Al ss, Ba ss, Cu ss, O<sub>6</sub> ss, O<sub>7</sub> ss, Sr ss, Ta ss, O ss, Y ss, MgO bin, Mg bin, O bin; MgO sur, Mg sur, O sur, MgO bin, Mg bin, O bin

☐ **L30 ANSWER 10 OF 103 INSPEC (C) 2004 IEE on STN****Accession Number**1994:4638890 INSPEC DN A9410-7360H-002 Full Text**Title**

*Effects of additive elements on electrical properties of tantalum oxide films.*

**Author/Inventor**

Fujikawa, H.; Taga, Y. (Toyota Central Res. &amp; Dev. Labs. Inc., Aichi, Japan)

**Source**

Journal of Applied Physics (1 March 1994) vol.75, no.5, p.2538-44. 22 refs.  
Price: CCCC 0021-8979/94/75(5)/2538/7/\$6.00 CODEN: JAPIAU ISSN: 0021-8979

**Abstract**

Ta<sub>2</sub>O<sub>5</sub>-based composite films prepared by magnetron sputtering have been investigated with respect to their dielectric properties. As additive third oxides, Y<sub>2</sub>O<sub>3</sub> and WO<sub>3</sub> were found to be effective materials for improving insulating properties. In these composite films, the dielectric constant remained unchanged. The maximum storage charge of the composite films was twice that of Ta<sub>2</sub>O<sub>5</sub> films. The main reason for improving the insulating properties could be explained by the charge compensation of excess oxygen by these additive oxides.

**Concept or Classification**

A7360H Insulating thin films; A6855 *Thin film growth, structure, and epitaxy*; A8115C Deposition by sputtering; A7720 Permittivity; A7755 Dielectric thin films CHI Ta<sub>2</sub>O<sub>5</sub>Y<sub>2</sub>O<sub>3</sub>WO<sub>3</sub> ss, Ta<sub>2</sub> ss, WO<sub>3</sub> ss, O<sub>3</sub> ss, O<sub>5</sub> ss, Ta ss, Y<sub>2</sub> ss, O ss, W ss, Y ss

☐ **L30 ANSWER 11 OF 103 INSPEC (C) 2004 IEE on STN****Accession Number**1992:4282545 INSPEC DN A9301-7755-003 Full Text**Title**

*Sr<sub>2</sub>AlTaO<sub>6</sub> films for multilayer high-temperature superconducting device applications.*

**Author/Inventor**

Findikoglu, A.T.; Doughty, C.; Bhattacharya, S.; Qi Li; Xi, X.X.; Venkatesan, T. (Center for Superconductivity Res., Maryland Univ., College Park, MD, USA); Fahey, R.E.; Strauss, A.J.; Phillips, J.M.

## Source

Applied Physics Letters (5 Oct. 1992) vol.61, no.14, p.1718-20. 11 refs. Price: CCCC 0003-6951/92/391718-03\$03.00 CODEN: APPLAB ISSN: 0003-6951

## Abstract

Thin films of Sr<sub>2</sub>AlTaO<sub>6</sub> (SAT) and multilayers of YBa<sub>2</sub>Cu<sub>3</sub>O<sub>7</sub> (YBCO)/SAT have been grown by pulsed laser deposition on (001) LaAlO<sub>3</sub> substrates. X-ray diffraction shows that SAT grows on (001) LaAlO<sub>3</sub> with the c-axis oriented normal to the substrate plane. X-ray rocking curve and Rutherford backscattering channeling measurements on SAT films yield full width at half maximum of <0.3 degrees and minimum backscattering yield chi min of 5%-7%, respectively, indicating good crystallinity. The real part of the dielectric constant in r is found to be approximately 23-30, with approximately 6\*10<sup>7</sup> V/m static breakdown electric field. Both the dielectric constant and the static breakdown field show negligible temperature dependence between 10 and 300 K. A 100 nm\*10 mu m\*50 mu m YBCO film on SAT shows zero-field critical current density of approximately 1.3\*10<sup>6</sup> A/cm<sup>2</sup> at 77 K, with a superconducting transition temperature T<sub>c</sub> of approximately 89.2 K.

## Concept or Classification

A7755 Dielectric thin films; A7470V Perovskite phase superconductors; A7475 Superconducting films; **A6855 Thin film growth, structure, and epitaxy**; A7920N Atom, molecule, and ion impact; A7460J Critical currents; A7750 Dielectric breakdown and space-charge effects; A6180M Channelling, blocking and energy loss of particles; A7720 Permittivity; A6865 Layer structures, intercalation compounds and superlattices: growth, structure and nonelectronic properties; A7410 Occurrence, critical temperature CHI YBa<sub>2</sub>Cu<sub>3</sub>O<sub>7</sub>-Sr<sub>2</sub>AlTaO<sub>6</sub> int, Sr<sub>2</sub>AlTaO<sub>6</sub> int, YBa<sub>2</sub>Cu<sub>3</sub>O<sub>7</sub> int, Ba<sub>2</sub> int, Cu<sub>3</sub> int, Sr<sub>2</sub> int, Al int, Ba int, Cu int, O<sub>6</sub> int, O<sub>7</sub> int, Sr int, Ta int, O int, Y int, Sr<sub>2</sub>AlTaO<sub>6</sub> ss, YBa<sub>2</sub>Cu<sub>3</sub>O<sub>7</sub> ss, Ba<sub>2</sub> ss, Cu<sub>3</sub> ss, Sr<sub>2</sub> ss, Al ss, Ba ss, Cu ss, O<sub>6</sub> ss, O<sub>7</sub> ss, Sr ss, Ta ss, O ss, Y ss; LaAlO<sub>3</sub> sur, Al sur, La sur, O<sub>3</sub> sur, O sur, LaAlO<sub>3</sub> ss, Al ss, La ss, O<sub>3</sub> ss, O ss; Sr<sub>2</sub>AlTaO<sub>6</sub> ss, Sr<sub>2</sub> ss, Al ss, O<sub>6</sub> ss, Sr ss, Ta ss, O ss

☐ L30 ANSWER 12 OF 103 INSPEC (C) 2004 IEE on STN

## Accession Number

1992:4305197 INSPEC DN A9303-8115C-001 [Full Text](#)

## Title

**Interaction between Nd<sub>0.4</sub>Sr<sub>0.6</sub>Al<sub>0.7</sub>Ta<sub>0.3</sub>O<sub>3</sub> substrates and YBa<sub>2</sub>Cu<sub>3</sub>O<sub>7</sub> films deposited by sputtering.**

## Author/Inventor

Zaitsev, A.; Klatt, K.H.; Reiche, P.; Meuffels, P.M. (Inst. fur Festkorperforschung, KFA Forschungszentrum Julich, Germany)

## Source

Materials Letters (Nov. 1992) vol.15, no.3, p.146-8. 9 refs. Price: CCCC 0167-577X/92/\$05.00 CODEN: MLETDJ ISSN: 0167-577X

## Abstract

Nd<sub>0.4</sub>Sr<sub>0.6</sub>Al<sub>0.7</sub>Ta<sub>0.3</sub>O<sub>3</sub> substrates with a lattice constant of 0.384 nm were used for the deposition of YBa<sub>2</sub>Cu<sub>3</sub>O<sub>7</sub>-x thin films by means of DC magnetron sputtering. This substrate material influences the film properties due to excessive interface reactions which cause a decrease in the superconducting transition temperature of the films and an apparent deterioration of the substrate surface.

## Concept or Classification

A8115C Deposition by sputtering; **A6855 Thin film growth, structure, and epitaxy**; A7470V Perovskite phase superconductors; A7410 Occurrence, critical temperature; A6822 Surface diffusion, segregation and interfacial compound formation; A7475 Superconducting films CHI YBa<sub>2</sub>Cu<sub>3</sub>O<sub>7</sub>-Nd<sub>0.4</sub>Sr<sub>0.6</sub>Al<sub>0.7</sub>Ta<sub>0.3</sub>O<sub>3</sub> int, Nd<sub>0.4</sub>Sr<sub>0.6</sub>Al<sub>0.7</sub>Ta<sub>0.3</sub>O<sub>3</sub> int, YBa<sub>2</sub>Cu<sub>3</sub>O<sub>7</sub> int, Al<sub>0.7</sub> int, Nd<sub>0.4</sub> int, Sr<sub>0.6</sub> int, Ta<sub>0.3</sub> int, Ba<sub>2</sub> int, Cu<sub>3</sub> int, Al int, Ba int, Cu int, Nd int, O<sub>3</sub> int, O<sub>7</sub> int, Sr int, Ta int, O int, Y int, Nd<sub>0.4</sub>Sr<sub>0.6</sub>Al<sub>0.7</sub>Ta<sub>0.3</sub>O<sub>3</sub> ss,

*YBa2Cu3O7 ss, Al0.7 ss, Nd0.4 ss, Sr0.6 ss, Ta0.3 ss, Ba2 ss, Cu3 ss, Al ss, Ba ss, Cu ss, Nd ss, O3 ss, O7 ss, Sr ss, Ta ss, O ss, Y ss; Nd0.4Sr0.6Al0.7Ta0.3O3 sur, Al0.7 sur, Nd0.4 sur, Sr0.6 sur, Ta0.3 sur, Al sur, Nd sur, O3 sur, Sr sur, Ta sur, O sur, Nd0.4Sr0.6Al0.7Ta0.3O3 ss, Al0.7 ss, Nd0.4 ss, Sr0.6 ss, Ta0.3 ss, Al ss, Nd ss, O3 ss, Sr ss, Ta ss, O ss; YBa2Cu3O ss, Ba2 ss, Cu3 ss, Ba ss, Cu ss, O ss, Y ss*

☐ **L30 ANSWER 13 OF 103 INSPEC (C) 2004 IEE on STN**

Accession Number

1992:4152905 INSPEC DN A9212-6848-007 [Full Text](#)

Title

*YBa2Cu3O7- delta -PrBa2Cu2TaO8 heterostructure made by pulsed laser deposition.*

Author/Inventor

Izumi, H.; Ohata, K.; Sawada, T.; Kawamoto, S.; Wada, T.; Yaegashi, Y.; Yamauchi, H.; Morishita, T.; Tanaka, S. (Supercond. Res. Lab., ISTEK, Tokyo, Japan)

Source

Physica C (1 Dec. 1991) vol.185-189, pt.3, p.2047-8. 6 refs. Price: CCCC 0921-4534/91/\$03.50 CODEN: PHYCE6 ISSN: 0921-4534 Conference: International Conference on Materials and Mechanisms of Superconductivity. High Temperature Superconductors III. Kanazawa, Japan, 22-26 July 1991

Abstract

The YBa2Cu3O7- delta (YBCO)/PrBa2Cu2TaO8 (PBCT) heterostructure was formed by pulsed laser deposition. The great possibility of PBCT for the barrier of junctions using YBCO has been confirmed. The lattice flexibility of PBCT is poorer than that of YBCO and YBCO can be used as a buffer layer between PBCT and substrates being lattice mismatched.

Concept or Classification

A6848 Solid-solid interfaces; A7470V Perovskite phase superconductors; A6855 *Thin film growth, structure, and epitaxy*; A8115J Ion plating and other vapour deposition; A7470J Superconducting layer structures and intercalation compounds CHI *YBa2Cu3O-PrBa2Cu2TaO8 int, PrBa2Cu2TaO8 int, YBa2Cu3O int, Ba2 int, Cu2 int, Cu3 int, Ba int, Cu int, O8 int, Pr int, Ta int, O int, Y int, PrBa2Cu2TaO8 ss, YBa2Cu3O ss, Ba2 ss, Cu2 ss, Cu3 ss, Ba ss, Cu ss, O8 ss, Pr ss, Ta ss, O ss, Y ss*

☐ **L30 ANSWER 14 OF 103 INSPEC (C) 2004 IEE on STN**

Accession Number

1989:3277612 INSPEC DN B89005594 [Full Text](#)

Title

*Degradation mechanisms of AC thin-film electroluminescence displays.*

Author/Inventor

Muller, G.O.; Mach, R.; Reetz, R.; Reinsperger, G.U. (Zentralinst. fur Elektronenphys., Berlin, East Germany)

Source

1988 SID International Symposium. Digest of Technical Papers. First Edition Editor(s): Morreale, J. Playa del Rey, CA, USA: SID, 1988. p.23-6 of x+494 pp. 17 refs. Conference: Anaheim, CA, USA, 24-26 May 1988 Price: CCCC 0097-0966X/88/0000-023-\$1.00+.00

Abstract

All results reported were obtained on experimental samples, in general of a size of 2\*2 mm2 or on 40 by 40 matrices of 0.1 by 0.1 mm2 pixels. The semiconductor film in all instances was ZnS:Mn, either vacuum-deposited (PVD) or chemically deposited (CVD or **ALE**). The insulator films were made of different oxides, often composite, of Al, Y, Mg, Zr, Al/Ti, **Ta** and Al/Y. Most of the materials were vacuum deposited and/or sputtered, but some have also been CVD prepared.

The most general experimental result is that the insulator material is of minor importance compared with its deviation from stoichiometry. All results reported were obtained on experimental samples, in general of a size of 2\*2 mm<sup>2</sup> or on 40 by 40 matrices of 0.1 by 0.1 mm<sup>2</sup> pixels. The semiconductor film in all instances was ZnS:Mn, either vacuum-deposited (PVD) or chemically deposited (CVD or **ALE**). The insulator films were made of different oxides, often composite, of Al, Y, Mg, Zr, Al/Ti, **Ta** and Al/**Y**. Most of the materials were vacuum deposited and/or sputtered, but some have also been CVD prepared. The most general experimental result is that the insulator material is of minor importance compared with its deviation from stoichiometry.

☐ **L30 ANSWER 15 OF 103 INSPEC (C) 2004 IEE on STN**

**Accession Number**

1987:2846253 INSPEC DN A87046695 Full Text

**Title**

***A study of yttrium-modified aluminide coatings on IN 738 alloy.***

**Author/Inventor**

Tu, D.C.; Lin, C.C.; Liao, S.J.; Chou, J.C. (Chung Shan Inst. of Sci. & Technol., Kangshan, Taiwan)

**Source**

Journal of Vacuum Science & Technology A (Vacuum, Surfaces, and Films) (Nov.-Dec. 1986) vol.4, no.6, p.2601-8. 8 refs. Price: CCCC 0734-2101/86/062601-08\$01.00 CODEN: JVTAD6 ISSN: 0734-2101 Conference: Proceedings of the 13th International Conference on Metallurgical Coatings. San Diego, CA, USA, 7-11 April 1986 Sponsor(s): American Vacuum Soc.; American Soc. Metals; Int. Union Vacuum Sci.; et al

**Abstract**

The beneficial effect of yttrium in high temperature protective coatings applied by EB-PVD and vacuum plasma spray against oxidation and hot corrosion has been recognized in many studies. In this study, the feasibility of adding yttrium into aluminide coatings has been successfully demonstrated by the conventional pack cementation process. It was found that yttrium oxide was the only practical inert filler material among the oxides investigated. Yttrium can be added into the aluminide coating either prior to or after the pack aluminizing process. Specimens prepared by the different pack cementation sequences were evaluated at 1000 degrees C for cyclic oxidation resistance up to 250 cycles. The yttriumized IN 738 and the yttriumized/aluminized IN 738 specimens showed very poor resistance compared to either the uncoated or the straight aluminized IN 738 specimens. Gross internal oxidation was found in the yttriumized/aluminized coating. On the other hand, the aluminized/yttriumized IN 738 showed marginal improvement over the straight aluminized IN 738. The aluminized/yttriumized coating had an yttrium rich outer oxide scale and an aluminum oxide inner scale, while the straight aluminized coating had a chromium rich outer oxide scale and an aluminum oxide inner scale.

**Concept or Classification**

**A6855 Thin film growth, structure, and epitaxy**; A8115 Methods of thin film deposition; A8160B Metals and alloys CHI **NiCrCoMoWTaAlTiC-Y2O3Al2O3 int, NiCrCoMoWTaAlTiC int, Y2O3Al2O3 int, Al2O3 int, Al2 int, Al int, Co int, Cr int, Mo int, Ni int, O3 int, Ta int, Ti int, Y2 int, C int, O int, W int, Y int, NiCrCoMoWTaAlTiC ss, Y2O3Al2O3 ss, Al2O3 ss, Al2 ss, Al ss, Co ss, Cr ss, Mo ss, Ni ss, O3 ss, Ta ss, Ti ss, Y2 ss, C ss, O ss, W ss, Y ss**; Y2O3:Al2O3 sur, Al2O3 sur, Y2O3 sur, Al2 sur, Al sur, O3 sur, Y2 sur, O sur, Y sur, Y2O3:Al2O3 ss, Al2O3 ss, Al2 ss, Al ss, O3 ss, Y2 ss, O ss, Y ss, Al2O3 bin, Y2O3 bin, Al2 bin, Al bin, O3 bin, Y2 bin, O bin, Y bin, Al2O3 dop, Al2 dop, Al dop, O3 dop, O dop

L30 ANSWER 16 OF 103 HCAPLUS COPYRIGHT 2004 ACS on STN DUPLICATE 1  
 2004:490384 Document No. 141:46049 Formation of capacitors for semiconductor devices with **Ta2O5-Y2O3** composite dielectric film on storage electrode. Ahn, Byoung Kwon; Park, Sung Hoon. US 2004115880 A1 20040617. APPLICATION: US 2003-603306 20030625. PRIORITY: KR 2002-78659 20021211.

AB Capacitors with sufficient capacitance for stable semiconductor device operation are fabricated by first forming an interlayer insulating film on a semiconductor substrate formed with a bit line. A contact plug to be in contact with the substrate is formed within the interlayer insulating film. A storage electrode is formed on the interlayer insulating film in such a manner that the storage electrode comes in contact with the contact plug. A dielec. film composed of a single composite film of **Ta2O5 (X)-Y2O3(1-X)** is also formed on the storage electrode by **atomic layer deposition**. A diffusion barrier film is deposited on the dielec. film, and a plate electrode is formed on the diffusion barrier film.

TI Formation of capacitors for semiconductor devices with **Ta2O5-Y2O3** composite dielectric film on storage electrode

ST yttria **tantalum** oxide dielec film capacitor semiconductor device

IT Vapor deposition process  
 (atomic layer-; formation of capacitors for semiconductor devices with **Ta2O5-Y2O3** composite dielec. film on storage electrode)

IT Diffusion barrier  
 (films; formation of capacitors for semiconductor devices with **Ta2O5-Y2O3** composite dielec. film on storage electrode)

IT Capacitor electrodes  
 Capacitors  
 Dielectric films  
 Semiconductor device fabrication  
 (formation of capacitors for semiconductor devices with **Ta2O5-Y2O3** composite dielec. film on storage electrode)

IT Annealing  
 (plasma; formation of capacitors for semiconductor devices with **Ta2O5-Y2O3** composite dielec. film on storage electrode)

IT 10024-97-2, Nitrogen oxide (N2O), uses  
 RL: NUU (Other use, unclassified); USES (Uses)  
 (annealing plasma; formation of capacitors for semiconductor devices with **Ta2O5-Y2O3** composite dielec. film on storage electrode)

IT 6074-84-6, **Tantalum** ethoxide  
 RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PYP (Physical process); PROC (Process)  
 (precursor; formation of capacitors for semiconductor devices with **Ta2O5-Y2O3** composite dielec. film on storage electrode)

IT 1314-36-9, Yttrium oxide (**Y2O3**), processes 1314-61-0, **Tantalum** oxide (**Ta2O5**)  
 RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PYP (Physical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)  
 (yttria-**tantalum** oxide composite dielec. film; formation of capacitors for semiconductor devices with **Ta2O5-Y2O3** composite dielec. film on storage electrode)

L30 ANSWER 18 OF 103 HCAPLUS COPYRIGHT 2004 ACS on STN

2004:293328 Document No. 140:313420 Process for semiconductor device fabrication in which a insulating layer is formed on a semiconductor substrate. Wilk, Glen David; Ye, Peide (Agere Systems, Inc., USA). U.S. Pat. Appl. Publ. **US 2004067660** A1 20040408, 12 pp. (English). CODEN: USXXCO. APPLICATION: US 2002-263638 **20021003**.

AB The present invention provides a method of manufacturing a semiconductor device. The method includes providing a III-V semiconductor substrate and depositing by **Atomic Layer Deposition**, an insulating layer on the III-V semiconductor substrate. Another embodiment of the present invention is an active device comprising the above-described III-V semiconductor substrate and. The present invention provides a method for manufacturing a semiconductor device comprising a III-V semiconductor substrate, and an insulating layer deposited on the substrate by **Atomic Layer Deposition (ALD)**. The use of **ALD** to deposit the insulating layer was found to facilitate the creation of active devices that avoid Fermi layer pinning. Such insulating layer may be advantageously used as a passivation layer in III-V substrate based active devices and transistors.

ST **ALD** dielec film IIIA pnictide semiconductor device fabrication

IT Vapor deposition process  
(chemical, **atomic-layer deposition**; process for semiconductor device fabrication in which insulating layer is formed on semiconductor substrate by **ALD**)

IT Annealing  
Capacitors  
Dielectric films  
MESFET (transistors)  
Passivation  
Rapid thermal annealing  
Semiconductor device fabrication  
Transistors  
(process for semiconductor device fabrication in which insulating layer is formed on semiconductor substrate by **ALD**)

IT 1312-81-8, Lanthanum oxide (La2O3) 1314-23-4, Zirconium oxide (ZrO2), uses 1314-36-9, Yttrium oxide (**Y2O3**), uses 1314-61-0, **Tantalum** oxide (**Ta2O5**) 12055-23-1, Hafnium oxide (HfO2) 13463-67-7, Titanium oxide (TiO2), uses 24304-00-5, Aluminum nitride (AlN) 25817-87-2, Hafnium nitride (HfN)

RL: DEV (Device component use); USES (Uses)

(process for semiconductor device fabrication in which insulating layer is formed on semiconductor substrate by **ALD**)

L30 ANSWER 19 OF 103 HCAPLUS COPYRIGHT 2004 ACS on STN

2004:191105 Document No. 140:244766 Reducing agent for high-k gate dielectric parasitic interfacial layer in semiconductor device fabrication. Paton, Eric N.; Yu, Bin (Advanced Micro Devices, Inc., USA). U.S. **US 6703277** B1 20040309, 15 pp. (English). CODEN: USXXAM.

APPLICATION: US 2002-118437 **20020408**.

AB A process is claimed of manufacturing semiconductor devices with a high-K dielec. material layer that improves device performance, while avoiding undesirable interactions between elements, such as the oxidation of silicon substrates or polysilicon gate electrodes by the high-K gate dielec. materials deposited thereon. A semiconductor device and a process for fabricating the device, the process including steps of depositing on the Si substrate a layer comprising at least one high-K dielec. material, whereby a quantity of SiO<sub>2</sub> is formed at an interface between the Si substrate and the high-K dielec. material layer; depositing on the high-K dielec. material layer a layer of a metal; and diffusing the metal through the high-K dielec. material layer, whereby the metal reduces at least a portion of the SiO<sub>2</sub> to Si and the metal is oxidized to form a dielec. material having a K value greater than SiO<sub>2</sub>. In another embodiment, the metal is implanted into the interfacial layer. A semiconductor device including such metal layer and implanted metal is also provided.

IT Vapor deposition process

(chemical, **ALD**; metal reducing agent for silica in forming dielec. film on silicon and silicon-germanium in semiconductor device fabrication)

IT 7429-90-5, Aluminum, processes 7440-25-7, **Tantalum**, processes  
7440-32-6, Titanium, processes 7440-33-7, Tungsten, processes  
7440-58-6, Hafnium, processes 7440-62-2, Vanadium, processes  
7440-65-5, Yttrium, processes 7440-67-7, Zirconium, processes  
7440-70-2, Calcium, processes

RL: CPS (Chemical process); NUU (Other use, unclassified); PEP (Physical, engineering or chemical process); PYP (Physical process); PROC (Process); USES (Uses)

(metal reducing agent for silica in forming dielec. film on silicon and silicon-germanium in semiconductor device fabrication)

IT 1306-38-3, Cerium oxide (CeO<sub>2</sub>), uses 1312-81-8, Lanthanum oxide (La<sub>2</sub>O<sub>3</sub>)  
1314-23-4, Zirconium oxide (ZrO<sub>2</sub>), uses 1314-35-8, Tungsten oxide (WO<sub>3</sub>),  
uses 1314-36-9, Yttrium oxide (**Y<sub>2</sub>O<sub>3</sub>**), uses 1314-61-0,  
**Tantalum** oxide (**Ta<sub>2</sub>O<sub>5</sub>**) 12003-65-5, Aluminum lanthanum  
oxide (AlLaO<sub>3</sub>) 12047-27-7, Barium titanate (BaTiO<sub>3</sub>), uses 12055-23-1,  
Hafnium oxide (HfO<sub>2</sub>) 12060-00-3, Lead titanium oxide (PbTiO<sub>3</sub>)  
12060-01-4, Lead zirconium oxide (PbZrO<sub>3</sub>) 12060-59-2, Strontium titanium  
oxide (SrTiO<sub>3</sub>) 12626-81-2, PZT 13463-67-7, Titanium oxide (TiO<sub>2</sub>), uses  
37293-13-3, Bismuth silicate 37303-24-5, Barium strontium titanium oxide  
(BaO-1SrO-1TiO<sub>3</sub>) 117990-33-7, Lead magnesium niobium oxide (Pb(Mg,Nb)O<sub>3</sub>)  
133426-25-2, Lead niobium zinc oxide (Pb(Nb,Zn)O<sub>3</sub>) 331985-27-4, Lead  
scandium **tantalum** oxide (Pb(Sc,Ta)O<sub>3</sub>)

RL: DEV (Device component use); USES (Uses)

(metal reducing agent for silica in forming dielec. film on silicon and silicon-germanium in semiconductor device fabrication)



L30 ANSWER 21 OF 103 HCAPLUS. COPYRIGHT 2004 ACS on STN

2003:449820 Document No. 139:15287 Method of forming thin film using **atomic layer deposition** method. Kim, Yeong-Kwan; Park, Young-Wook; Lim, Jae-Soon; Choi, Sung-Je; Lee, Sang-In US **6576053** B1 20030610 APPLICATION: US 2000-679559 **20001006**.

AB In a method of forming a thin film using an **atomic layer deposition (ALD)** method, a thin film is formed on a substrate in cycles. Each cycle includes injecting a 1st reactant including an atom that forms the thin film and a ligand into a reaction chamber that includes the substrate, purging the 1st reactant, injecting a 2nd reactant into the reaction chamber, and purging the 2nd reactant. The thin film is formed by a chemical reaction between the atom that forms the thin film and a 2nd reactant whose binding energy with respect to the atom that forms the thin film is larger than the binding energy of the ligand with respect to the atom that forms the thin film and the generation of byproducts is prevented. The generation of a hydroxide byproduct in the thin film is suppressed by using a material that does not include a hydroxide as the 2nd reactant, purging the 2nd reactant, and reacting the 2nd reactant with a 3rd reactant that includes hydroxide. After purging the 2nd reactant, the 3rd reactant for removing impurities and improving the stoichiometry of the thin film is injected and purged. In this way, it is possible to obtain a thin film that does not include impurities and whose stoichiometry is excellent.

IT 1306-38-3, Cerium oxide (CeO<sub>2</sub>), processes 1313-96-8, Niobium oxide (Nb<sub>2</sub>O<sub>5</sub>) 1314-23-4, Zirconium oxide (ZrO<sub>2</sub>), processes 1314-36-9, Yttrium oxide (Y<sub>2</sub>O<sub>3</sub>), processes 1314-61-0, **Tantalum** oxide (Ta<sub>2</sub>O<sub>5</sub>) 1344-28-1, Aluminum oxide (Al<sub>2</sub>O<sub>3</sub>), processes 7631-86-9, Silicon oxide (SiO<sub>2</sub>), processes 10043-11-5, Boron nitride (BN), processes 12030-49-8, Iridium oxide (IrO<sub>2</sub>) 12033-62-4, **Tantalum** nitride (TaN) 12033-89-5, Silicon nitride, processes 12036-10-1, Ruthenium oxide (RuO<sub>2</sub>) 12055-23-1, Hafnium oxide (HfO<sub>2</sub>) 12058-38-7, Tungsten nitride (WN) 12060-00-3, Lead titanium oxide (PbTiO<sub>3</sub>) 12060-59-2, Strontium titanium oxide (SrTiO<sub>3</sub>) 12169-14-1, Ruthenium strontium oxide (RuSrO<sub>3</sub>) 12313-89-2, Calcium ruthenium oxide (CaRuO<sub>3</sub>) 12626-81-2, Lead titanium zirconium oxide (PbTiO<sub>3</sub>-1ZrO<sub>3</sub>-103) 12676-60-7, Lanthanum lead titanium zirconium oxide (LaO-1PbO-1TiO<sub>3</sub>-1ZrO<sub>3</sub>-103) 13463-67-7, Titanium oxide (TiO<sub>2</sub>), processes 24304-00-5, Aluminum nitride 24621-21-4, Niobium nitride (NbN) 25583-20-4, Titanium nitride (TiN) 25617-97-4, Gallium nitride (GaN) 25658-42-8, Zirconium nitride (ZrN) 37303-24-5, Barium strontium titanium oxide (BaO-1SrO-1TiO<sub>3</sub>) 50926-11-9, Indium tin oxide 62169-83-9, Tungsten boride nitride (WBN) 115964-97-1, Aluminum nitride silicide (AlNSi) 118408-58-5, Tungsten nitride silicide (WNSi) 148793-50-4, Aluminum titanium nitride (AlTiN) 150341-71-2, Indium zirconium oxide 162124-23-4, Calcium ruthenium strontium oxide (CaO-1RuSrO-103) 167493-27-8, Titanium nitride silicide (TiNSi) 176660-45-0, **Tantalum** nitride silicide (TaNSi) 187816-59-7, Barium ruthenium strontium oxide ((Ba,Sr)RuO<sub>3</sub>)  
 RL: FMU (Formation, unclassified); PEP (Physical, engineering or chemical process); PYP (Physical process); TEM (Technical or engineered material use); FORM (Formation, nonpreparative); PROC (Process); USES (Uses)  
 (film; method of forming thin film using **atomic layer deposition** method)

L30 ANSWER 23 OF 103 HCAPLUS COPYRIGHT 2004 ACS on STN

2002:155022 Document No. 136:192063 Precursor source-material mixture, method for film deposition, and formation of structure. Buchanan, Douglas; Neumayer, Deborah Ann (International Business Machines Corp., USA). **JP 2002060944** A2 20020228 APPLICATION: JP 2001-122174 20010420. PRIORITY: **US 2000-553997 20000420**.

AB A precursor source-material mixture useful for CVD or **ALD** comprises a solution, suspension, or emulsion of an inert liquid containing  $MR_1xR_2yAz$ , where M = Li, Na, K, Rb, Cs, Fr, Be, Mg, Ti, Zr, Hf, Sc, Y, La, V, Nb, Ta, Cr, Mo, W, Mn, Re, Fe, Ru, Os, CO, Rh, Ir, Ni, Pd, Pt, Cu, Ag, Au, Zn, Cd, Hg, B, Al, Ga, In, Tl, Si, Ge, Sn, Pb, As, P, Sb, or Bi, R1, R2 = ligand such as (substituted)alkyl, alkenyl, cycloalkenyl, aryl, alkyne, carbonyl, amide, imide, hydrazide, P compound, nitrosyl, nitryl, nitrate, nitrile, halide, azide, alkoxy, siloxy, or silyl, A = ligand such as phosphine, phosphite, amine, arsine, stibine, ether, sulfide, nitryl, isonitrile, alkene, hydrazine, pyridine, N heterocyclic compound, large cyclic mol., Schiff base, cycloalkene, alc., phosphine oxide, alkylidene, nitrite, alkyne, or H<sub>2</sub>O,  $x \geq 1$ ,  $x + y = \text{valency of M}$ , and  $z \geq 0$ . A method is also described, for forming a structure such as a wiring structure, a capacitor, or a FET using the above mixture

IT Capacitors

Emulsions

Field effect transistors

Interconnections, electric

Solutions

Suspensions

Vapor deposition process

(precursor source-material mixture, method for CVD or **ALD** film deposition, and formation of structure)

IT 1344-28-1, Alumina, processes 7440-33-7, Tungsten, processes

7440-50-8, Copper, processes 10101-52-7, Zirconium silicate

12017-12-8, Cobalt disilicide 12033-62-4, **Tantalum** nitride

25617-98-5, Indium nitride

RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PROC (Process)

(precursor source-material mixture, method for CVD or **ALD** film deposition, and formation of structure)

IT 1314-23-4, Zirconia, uses 3385-78-2, Trimethylindium 10210-68-1

12261-30-2 13746-89-9, Zirconium nitrate 14040-11-0, Hexacarbonyl

tungsten 19782-68-4, Tetrakis(dimethylamino) hafnium 19824-59-0

22411-22-9D, oxidized 51278-20-7D, oxidized 124330-23-0,

Dimethylethylamine alane

RL: NUU (Other use, unclassified); USES (Uses)

(precursor source-material mixture, method for CVD or **ALD** film deposition, and formation of structure)

L30 ANSWER 24 OF 103 HCAPLUS COPYRIGHT 2004 ACS on STN

2002:924298 Document No. 137:392152 Procedure for forming a thin layer for a semiconductor device using atomic layer separation. Kim, Yeong-kwan; Park, Young-wook; Lee, Seung-hwan (Samsung Electronics Co., Ltd., S. Korea). Ger. Offen. DE 10132882 A1 20021205 PRIORITY: US 2001-872203 20010531.

AB The present invention plans a procedure for forming thin layers by **atomic layer deposition (ALD)**. A **ALD** reactor with only one reaction area is provided. A group length of substrates is loaded simultaneous into the single reaction area of the **ALD** reactor. Subsequently, a reactive gas is brought into the reaction area, and a part of the reactive medium is chemisorbed onto the upper surfaces of the stack of substrates within the reaction area. The reactive medium that is not chemisorbed is removed subsequently from the reaction area. According to an embodiment of the present invention, after the reactive medium is brought into the reaction area, the portion of the medium that is not chemisorbed is diluted for facilitating the removal of the medium.

IT 1306-38-3, Cerium oxide (CeO<sub>2</sub>), uses 1312-43-2, Indium oxide (In<sub>2</sub>O<sub>3</sub>) 1313-96-8, Niobium oxide (Nb<sub>2</sub>O<sub>5</sub>) 1314-23-4, Zirconium oxide (ZrO<sub>2</sub>), uses 1314-36-9, Yttrium oxide (Y<sub>2</sub>O<sub>3</sub>), uses 1314-61-0, **Tantalum** oxide (**Ta<sub>2</sub>O<sub>5</sub>**) 1344-28-1, Alumina, uses 7429-90-5, Aluminum, uses 7439-88-5, Iridium, uses 7439-98-7, Molybdenum, uses 7440-06-4, Platinum, uses 7440-16-6, Rhodium, uses 7440-18-8, Ruthenium, uses 7440-21-3, Silicon, uses 7440-22-4, Silver, uses 7440-25-7, Tantalum, uses 7440-32-6, Titanium, uses 7440-33-7, Tungsten, uses 7440-50-8, Copper, uses 7631-86-9, Silica, uses 10043-11-5, Boron nitride (BN), uses 12030-49-8, Iridium oxide (IrO<sub>2</sub>) 12033-62-4, Tantalum nitride (TaN) 12033-89-5, Silicon nitride, uses 12033-94-2, Tantalum nitride (Ta<sub>3</sub>N<sub>5</sub>) 12036-10-1, Ruthenium oxide (RuO<sub>2</sub>) 12055-23-1, Hafnium oxide (HfO<sub>2</sub>) 12058-38-7, Tungsten nitride (WN) 12060-00-3, Lead titanium oxide (PbTiO<sub>3</sub>) 12060-59-2, Strontium titanate (SrTiO<sub>3</sub>) 12169-14-1, Ruthenium strontium oxide (RuSrO<sub>3</sub>) 12313-89-2, Calcium ruthenium oxide (CaRuO<sub>3</sub>) 12626-81-2, Lead titanium zirconium oxide (PbTiO-1ZrO-1O<sub>3</sub>) 12676-60-7, PLZT 13463-67-7, Titanium dioxide, uses 24304-00-5, Aluminum nitride (AlN) 24621-21-4, Niobium nitride (NbN) 25583-20-4, Titanium nitride (TiN) 25617-97-4, Gallium nitride 25658-42-8, Zirconium nitride (ZrN) 37303-24-5, Barium strontium titanium oxide (BaO-1SrO-1TiO<sub>3</sub>) 50926-11-9, Indium tin oxide 52337-09-4, Silicon titanium oxide 62169-83-9, Tungsten boride nitride (WBN) 104365-93-7, Silicon tantalum oxide 118408-58-5, Tungsten nitride silicide (WNSi) 148793-50-4, Aluminum titanium nitride (AlTiN) 150341-71-2, Indium zirconium oxide 158346-34-0, Indium iron oxide 159995-97-8, Aluminum silicon oxide 162124-23-4, Calcium ruthenium strontium oxide (CaO-1RuSrO-1O<sub>3</sub>) 163332-36-3, Hafnium silicon oxide 167493-27-8, Titanium nitride silicide (TiNSi) 174633-44-4, Silicon zirconium oxide 176660-45-0, Tantalum nitride silicide (TaNSi) 183006-88-4, Cesium silicon oxide 187816-59-7, Barium ruthenium strontium oxide ((Ba,Sr)RuO<sub>3</sub>)

RL: DEV (Device component use); USES (Uses)

(procedure for forming a thin layer for a semiconductor device using atomic layer separation)

L30 ANSWER 25 OF 103 HCAPLUS COPYRIGHT 2004 ACS on STN

2001:410322 Document No. 135:12405 A film formation method using  
**atomic layer deposition.** Kim, Young Kwan;

Park, Young Wook; Rim, Jae Soon; Choi, Sung Je; Lee, Sang In (Samsung Electronics Co., Ltd., S. Korea). **JP 2001152339 A2 20010605**

AB The title method includes introducing and chemisorbing a first process gas containing a film element and a ligand onto the substrate inside a reaction chamber, purging any process gas physisorbed on the substrate with an inert gas, introducing a second process gas whose binding energy with the film element is greater than that of the ligand, and depositing an atomic layer by the reaction of the second process gas and the film element while removing the ligand without producing side products. Alternatively, a compound not containing hydroxyl groups is used as a second process gas, and a third process gas containing hydroxyl groups is introduced after purging the second process gas in order to prevent the formation of side products of hydroxyl groups. Alternatively, ozone is introduced as a fourth process gas after purging the third process gas in order to remove impurities and improve the stoichiometry.

IT 1306-38-3, Cerium oxide (CeO<sub>2</sub>), processes 1312-43-2, Indium oxide (In<sub>2</sub>O<sub>3</sub>) 1313-96-8, Niobium oxide (Nb<sub>2</sub>O<sub>5</sub>) 1314-23-4, Zirconium oxide (ZrO<sub>2</sub>), processes 1314-36-9, Yttrium oxide (**Y<sub>2</sub>O<sub>3</sub>**), processes 1314-61-0, **Tantalum** oxide (**Ta<sub>2</sub>O<sub>5</sub>**) 1344-28-1, Aluminum oxide (Al<sub>2</sub>O<sub>3</sub>), processes 7631-86-9, Silicon oxide (SiO<sub>2</sub>), processes 12030-49-8, Iridium oxide (IrO<sub>2</sub>) 12036-10-1, Ruthenium oxide (RuO<sub>2</sub>) 12055-23-1, Hafnium oxide (HfO<sub>2</sub>) 12060-00-3, Lead titanium oxide (PbTiO<sub>3</sub>) 12060-59-2, Strontium titanium oxide (SrTiO<sub>3</sub>) 12169-14-1, Ruthenium strontium oxide (RuSrO<sub>3</sub>) 12313-89-2, Calcium ruthenium oxide (CaRuO<sub>3</sub>) 12626-81-2, Lead titanium zirconium oxide (PbTiO-1ZrO-1O<sub>3</sub>) 12676-60-7, Lanthanum lead titanium zirconium oxide (LaO-1PbO-1TiO-1ZrO-1O<sub>3</sub>) 13463-67-7, Titanium oxide (TiO<sub>2</sub>), processes 37303-24-5, Barium strontium titanium oxide (BaO-1SrO-1TiO<sub>3</sub>) 50926-11-9, Indium tin oxide 150341-71-2, Indium zirconium oxide 162124-23-4, Calcium ruthenium strontium oxide ((Ca,Sr)RuO<sub>3</sub>) 187816-59-7, Barium ruthenium strontium oxide ((Ba,Sr)RuO<sub>3</sub>)  
RL: PEP (Physical, engineering or chemical process); PROC (Process)  
(oxide film formation method using **atomic layer deposition**)

L30 ANSWER 26 OF 103 HCAPLUS COPYRIGHT 2004 ACS on STN

2000:96124 Document No. 132:159259 Thin film manufacturing process with **atomic layer deposition**. Kim, Yeong-kwan;

Lee, Sang-in; Park, Chang-soo; Lee, Sang-min (Samsung Electronics Co. Ltd., Suwon, S. Korea). **DE 19853598 A1 20000210**

AB Thin films of metals, binary and ternary oxides, and binary and ternary nitrides are manufactured by an **atomic layer deposition** process. A first reactant (ARn) is introduced into the reactor chamber and allowed to adsorb phys. to the substrate. The chamber is then evacuated to remove unadsorbed reactant. The introduction/evacuation process is repeated multiple times to establish a uniform monolayer of (ARn). A second reactant (BPn) is then introduced and allowed to adsorb on the first monolayer. Ligand exchange occurs between adsorbed mols. of (ARn) and gas mols. of (BPn), leaving AB on the substrate surface, and allowing RP to be taken from the reactor via evacuation. Introduction and evacuation of BPn is repeated multiple times to establish a uniform AB film. This process can be implemented for use in thin film production for semiconductor components, liquid crystal and electroluminescent displays.

ST semiconductor device film manuf **atomic layer deposition**; liq crystal display film **atomic layer deposition**; electroluminescent display film **atomic layer deposition**

IT 1306-38-3P, Cerium oxide (CeO<sub>2</sub>), preparation 1312-43-2P, Indium oxide (In<sub>2</sub>O<sub>3</sub>) 1313-96-8P, Niobium oxide (Nb<sub>2</sub>O<sub>5</sub>) 1314-23-4P, Zirconium oxide (ZrO<sub>2</sub>), preparation 1314-36-9P, Yttrium oxide (Y<sub>2</sub>O<sub>3</sub>), preparation 1314-61-0P, **Tantalum** oxide (Ta<sub>2</sub>O<sub>5</sub>) 1344-28-1P, Alumina, preparation 7429-90-5P, Aluminum, preparation 7439-88-5P, Iridium, preparation 7439-98-7P, Molybdenum, preparation 7440-06-4P, Platinum, preparation 7440-16-6P, Rhodium, preparation 7440-18-8P, Ruthenium, preparation 7440-22-4P, Silver, preparation 7440-25-7P, **Tantalum**, preparation 7440-32-6P, Titanium, preparation 7440-33-7P, Tungsten, preparation 7440-50-8P, Copper, preparation 7631-86-9P, Silica, preparation 10043-11-5P, Boron nitride (BN), preparation 12030-49-8P, Iridium oxide (IrO<sub>2</sub>) 12033-62-4P, **Tantalum** nitride (TaN) 12033-89-5P, Silicon nitride, preparation 12033-94-2P, **Tantalum** nitride (Ta<sub>3</sub>N<sub>5</sub>) 12036-10-1P, Ruthenium oxide (RuO<sub>2</sub>) 12055-23-1P, Hafnium oxide (HfO<sub>2</sub>) 12058-38-7P, Tungsten nitride (WN) 12060-00-3P, Lead titanium oxide (PbTiO<sub>3</sub>) 12060-59-2P, Strontium titanate (SrTiO<sub>3</sub>) 12169-14-1P, Ruthenium strontium oxide (RuSrO<sub>3</sub>) 12313-89-2P, Calcium ruthenium oxide (CaRuO<sub>3</sub>) 12626-81-2P, Lead titanium zirconium oxide (PbTiO-1ZrO-1O<sub>3</sub>) 12676-60-7P, Lanthanum lead titanium zirconium oxide (LaO-1PbO-1TiO-1ZrO-1O<sub>3</sub>) 13463-67-7P, Titanium oxide (TiO<sub>2</sub>), preparation 24304-00-5P, Aluminum nitride (AlN) 24621-21-4P, Niobium nitride (NbN) 25617-97-4P, Gallium nitride (GaN) 25658-42-8P, Zirconium nitride (ZrN) 37303-24-5P, Barium strontium titanium oxide (BaO-1SrO-1TiO<sub>3</sub>) 50926-11-9P, Indium tin oxide 62169-83-9P, Tungsten boride nitride (WBN) 106389-69-9P, Aluminum titanium nitride (AlTiN) 115964-97-1P, Aluminum nitride silicide (AlNSi) 118408-58-5P, Tungsten nitride silicide (WNSi) 150341-71-2P, Indium zirconium oxide 158346-34-0P, Indium iron oxide 162124-23-4P, Calcium ruthenium strontium oxide (CaO-1RuSrO-1O<sub>3</sub>) 176660-45-0P, **Tantalum** nitride silicide (TaNSi) 209530-51-8P, Titanium nitride silicide (TiNSi)

RL: PNU (Preparation, unclassified); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)

(thin film manufacturing process with **atomic layer deposition**)

☐ **L34 ANSWER 1 OF 14 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN DUPLICATE 1**
**Accession Number**2002-130222 [17] WPIX Full Text**Title**

*Thin film production containing silicon dioxide comprises bonding vaporizable silicon compound having organic ligands to substrate, and contacting silicon compound with vaporized, reactive oxygen source.*

**Author/Inventor**

ARO, E; HAUKKA, S; TUOMINEN, M; TOIS, E

**Patent Assignee/Corporate Source**

(ASMM-N) ASM MICROCHEMISTRY OY; (ASMM-N) ASM MICROCHEMISTRY LTD; (HAUK-I) HAUKKA S; (TOIS-I) TOIS E; (TUOM-I) TUOMINEN M

**Patent Information**

| PATENT NO.           | KIND | DATE     | WEEK      | LA | PG | MAIN IPC    |
|----------------------|------|----------|-----------|----|----|-------------|
| (1) WO 2001040541    | A1   | 20010607 | (200217)* | EN | 22 | C23C016-40  |
| AU 2001023743        | A    | 20010612 | (200217)  |    |    | C23C016-40  |
| FI 9902616           | A    | 20010604 | (200217)  |    |    | C23C016-44  |
| (2) EP 1248865       | A1   | 20021016 | (200276)  | EN |    | C23C016-40  |
| KR 2002063196        | A    | 20020801 | (200308)  |    |    | H01L021-203 |
| JP 2003515674        | W    | 20030507 | (200331)  |    | 26 | C23C016-42  |
| <b>US 2003188682</b> | A1   | 20031009 | (200367)  |    |    | C30B023-00  |
| <b>US 2004065253</b> | A1   | 20040408 | (200426)  |    |    | C30B023-00  |

**Application Details**

US 2003188682 A1 CIP of WO 2000-FI1072 20001204, US 2002-148525 20020827; US 2004065253 A1 Cont of WO 2000-FI1072 20001204, Cont of US 2002-148525 **20020827**, US 2003-678766 20031003

**Priority Application Information**

|              |          |
|--------------|----------|
| FI 1999-2616 | 19991203 |
|--------------|----------|

**International Patent Classification**

ICM C23C016-40; C23C016-42; C23C016-44; C30B023-00; H01L021-203  
 ICS C23C016-00; C30B025-00; C30B025-02; C30B028-12; C30B028-14  
 H01L021-316  
 H01L021:316

**Abstract**

WO 200140541 A UPAB: 20020313

NOVELTY - A thin film containing silicon dioxide is produced by atomic layer chemical vapor deposition (**ALCVD**), which includes bonding a vaporizable silicon compound having organic ligand(s), to a growth substrate; and converting the bonded silicon compound to silicon dioxide by contacting the silicon compound with a vaporized, reactive oxygen source.

USE - For producing thin films containing silicon dioxide or multi-component oxides (i.e., mixed or tertiary oxides) in semiconductors.

ADVANTAGE - The process provides a controlled growth of silicon dioxide at short reaction time.

Dwg.0/0

**Technology**

WO 200140541 A1UPTX: 20020313 TECHNOLOGY FOCUS - INORGANIC CHEMISTRY - Preferred Materials: The oxygen reagent is water, oxygen, hydrogen peroxide, aqueous solution of hydrogen peroxide, and/or ozone. The reactive oxygen source is nitrogen oxide, e.g. nitrous oxide, nitric oxide, and nitrogen dioxide; an oxyhalide compound, e.g. chlorine dioxide and perchloro acid; or oxygen or hydroxyl radical. The substrate surface has hydroxyl and optionally oxide groups that react with the silicon compound. Preferred Product: Mixed oxide film containing zirconium, titanium, hafnium, **tantalum**, aluminum, **yttrium**, and/or

lanthanum oxide, is grown on the substrate. TECHNOLOGY FOCUS - ORGANIC CHEMISTRY - Preferred Materials: The reactive oxygen source is a peracid, e.g. perbenzoic or peracetic acid; or alcohol, e.g. methanol and ethanol. The silicon compound is silane of formula  $\text{Si}m\text{L}2m+2$ , siloxane of formula  $\text{Si}y\text{O}y-1\text{L}2y+2$ , or silazane of formula  $\text{Si}y\text{NH}y-1\text{L}2y+2$ . The silane compound formed in situ is of formula  $\text{SiL}1\text{L}2\text{L}3\text{L}4$ . Preferably, the silicon compound is 3-aminoalkyltrialkoxysilane or hexa-alkyldisilazane, where the alkyl and alkoxy groups contain 1-10C.  $m = 1-3$ ;  $y = 2-4$ ;  $L = \text{F, Cl, Br, I, alkyl, aryl, alkoxy, vinyl, cyano, amino, silyl, alkylsilyl, alkoxysilyl, silylene, or alkylsiloxane}$ ;  $L1 = \text{amino}$ ; and  $L2-L4 = \text{alkyl or alkoxy}$ . When the silicon compound contains both alkyl and alkoxy groups, at least one of the groups is substituted. Preferred Property: The boiling point of the silicon compound at 10 mbar is at most 400 degrees C.

TECHNOLOGY FOCUS - ELECTRONICS - Preferred Method: The gas-phase silicon compound capable of reacting with hydroxyl and optionally oxide groups is formed in situ. Silicon dioxide is produced by contacting the silicon compound with a gas containing 1-30 vol.% ozone. The bonding and the conversion steps are conducted at the same temperature. The gas-phase silicon compound is formed by contacting a growth substrate with hexa-alkyldisilazane at 350-450 degrees C and 0.1-50 mbar.

#### Manual Codes

CPI: L04-C01B; L04-C12A EPI: U11-A08A1; U11-C01J2; U11-C05A1; U11-C05B7

#### ☐ L34 ANSWER 2 OF 14 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN

##### Accession Number

2004-479021 [45] WPIX [Full Text](#)

##### Title

***Formation of capacitor of semiconductor device comprises forming dielectric film composed of single composite film of specific formula, on storage electrode according to atomic layer deposition technology.***

##### Author/Inventor

***AHN, B K; PARK, S H***

##### Patent Assignee/Corporate Source

(AHNB-I) AHN B K; (PARK-I) PARK S H

##### Patent Information

| PATENT NO.           | KIND | DATE     | WEEK      | LA | PG | MAIN IPC   |
|----------------------|------|----------|-----------|----|----|------------|
| <b>US 2004115880</b> | A1   | 20040617 | (200445)* |    | 8  | H01L021-00 |

##### Application Details

***US 2004115880 A1 US 2003-603306 20030625***

##### Priority Application Information

|               |          |
|---------------|----------|
| KR 2002-78659 | 20021211 |
|---------------|----------|

##### International Patent Classification

ICM H01L021-00

ICS H01L021-8242

##### Abstract

US2004115880 A UPAB: 20040716

NOVELTY - A capacitor (20) of a semiconductor device is formed by forming a dielectric film (11) composed of a single composite film of specific formula, on a storage electrode (10) according to ***atomic layer deposition*** technology.

DETAILED DESCRIPTION - Formation of a capacitor of a semiconductor device comprises forming an interlayer insulating film (3) on a semiconductor substrate (1) formed with a bit line (2); forming a contact plug (6) in contact with the substrate within the interlayer insulating film; forming a storage electrode on

the interlayer insulating film, such that the storage electrode comes in contact with the contact plug; forming a dielectric film composed of a single composite film of **Ta<sub>2</sub>O<sub>5</sub>** (X)**Y<sub>2</sub>O<sub>3</sub>** (1-X) on the storage electrode according to **atomic layer deposition (ALD)** technology; depositing a diffusion barrier film (12) on the dielectric film; and forming a plate electrode (13) on the diffusion barrier film.

USE - Used for the formation of a capacitor of a semiconductor device (claimed).

ADVANTAGE - The capacitor can secure high capacitance without loss of its performance. It has good properties, causing no leakage current.

DESCRIPTION OF DRAWING(S) - The figure is a sectional view for the formation of capacitor of a semiconductor device.

Semiconductor substrate 1

Bit line 2

Interlayer insulating film 3

Contact plug 6

Storage electrode 10

Dielectric film 11

Diffusion barrier film 12

Plate electrode 13

Capacitor 20

Dwg.1F/1

☐ **L34 ANSWER 3 OF 14 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN**

Accession Number

2004-246641 [23] WPIX Full Text

Title

***Formation of oxide layer for forming capacitor of semiconductor device, by exposing the substrate surface to precursor including amino functional group, and oxidizing the chemisorbed precursor layer with oxidant.***

Author/Inventor

LEE, Y J; LIM, G B; PARK, G Y; PARK, I S; YEO, J H; IM, G; LEE, Y; PARK, I; PARK, K; YEO, J

Patent Assignee/Corporate Source

(SMSU) SAMSUNG ELECTRONICS CO LTD; (IMGG-I) IM G; (LEEY-I) LEE Y; (PARK-I) PARK I; (PARK-I) PARK K; (YEOJ-I) YEO J

Patent Information

| PATENT NO.           | KIND | DATE     | WEEK      | LA | PG | MAIN IPC    |
|----------------------|------|----------|-----------|----|----|-------------|
| <b>US 2004033698</b> | A1   | 20040219 | (200423)* |    | 26 | H01L021-31  |
| KR 2004016779        | A    | 20040225 | (200439)  |    |    | H01L021-205 |

Application Details

US 2004033698 A1 **US 2003-632825 20030804**; KR 2004016779 A KR 2003-52909 20030730

Abstract

US2004033698 A UPAB: 20040405

NOVELTY - An oxide layer is formed by exposing the substrate surface to a precursor including an amino functional group to form a chemisorbed precursor layer on the substrate surface, and oxidizing the chemisorbed precursor layer with an oxidant to form an oxide layer on the substrate surface.

DETAILED DESCRIPTION - INDEPENDENT CLAIMS are also included for:

(1) a method of forming a capacitor of semiconductor device comprising forming a first electrode (128) on a semiconductor substrate (100), exposing the first electrode to a precursor containing an amino functional group to form a chemisorbed precursor layer on the substrate, reacting the precursor layer with



an oxidant for form an oxide dielectric layer, and forming a second electrode (132) on the dielectric layer; and

(2) a method of forming a thin oxide film on a semiconductor substrate.

USE - For forming an oxide layer on a substrate, useful as dielectric layer (130) for the formation of a capacitor of a semiconductor device.

ADVANTAGE - The invention forms an oxide layer having an improved deposition rate and improved deposition characteristics using an **atomic layer deposition**. It exhibits improved step coverage and decreased pattern loading rate effects. When the thin film is applied as a dielectric layer in a semiconductor process, the stability and reliability of the semiconductor device can be improved.

DESCRIPTION OF DRAWING(S) - The figure shows a cross-sectional view for forming a capacitor in a semiconductor process.

Semiconductor substrate 100

Gate insulation layer 104

First electrode 128

Dielectric layer 130

Second electrode 132

Dwg. 8E/10

#### Technology

US 2004033698 A1UPTX: 20040405 TECHNOLOGY FOCUS - INORGANIC CHEMISTRY -

Preferred Component: The oxidant is hydrogen peroxide, water, ozone (preferably), nitrous oxide, nitrogen oxide, plasma oxygen remote from oxygen, or plasma nitrous oxide. The metal oxide layer is hafnium oxide, zirconium oxide, **tantalum** oxide, **yttrium** oxide, niobium oxide, titanium oxide, cerium oxide, indium oxide, ruthenium oxide, magnesium oxide, strontium oxide, boron oxide, silicon oxide, germanium oxide, tin oxide, lead monoxide, lead dioxide, vanadium oxide, lanthanum oxide, arsenic pentoxide, arsenic oxide, praseodymium oxide, antimony oxide, antimony pentoxide, calcium oxide, or phosphorus pentoxide.

TECHNOLOGY FOCUS - ORGANIC CHEMISTRY - Preferred Component: The precursor is of a chemical formula of  $MX_n$  or  $MX_nY_m$ . It can be tetrakis-ethyl methyl amino hafnium, tetrakis-diethyl amino hafnium, tetrakis-dimethyl amino hafnium,  $Hf(N(C_3H_7)_2)_4$ ,  $Hf(N(C_4H_9)_2)_4$ ,  $Ti(N(CH_3)C_2H_5)_4$ ,  $Zr(N(CH_3)C_2H_5)_4$ ,  $Sn(N(CH_3)C_2H_5)_4$ ,  $Si(N(CH_3)C_2H_5)_4$ ,  $Ta(N(CH_3)C_2H_5)_5$ ,  $Al(N(CH_3)C_2H_5)_3$ , or  $(CH_3)_2AlNH_2$ . M = element from groups, 2, 3A including lanthanide, 4A, 5A, 3B, 4B, or 5B of the periodic table (preferably Ba, Y, La, Ti, Zr, Hf (preferably), V, Nb, Ta, Al, Ge, Pb, As, Sn, Si, or Bi); X = -NR<sub>1</sub>R<sub>2</sub>; R<sub>1</sub>, R<sub>2</sub> = H, or 1-4C alkyl; n = 2-5; Y = H, 1-4C alkyl, or amino functional groups -NR<sub>3</sub>R<sub>4</sub>; R<sub>3</sub>, R<sub>4</sub> = H or 1-4C alkyl; m = 0-4. The m and n satisfy the equation  $(m+n) = S$ .

TECHNOLOGY FOCUS - ELECTRONICS - Preferred Method: The precursor is introduced in the chamber at not more than 300 degrees C and not more than 0.4 Torr and using an inert carrier gas.

#### Manual Codes

CPI: E05-E03; E05-F02; E05-G06; E05-H; E05-J; E05-L; E05-M; E05-N; E31-H05; E31-K04; E31-K07; E31-L; E31-P01; E31-P06E; E31-Q04; E31-Q08; E34; E35; E35-K01; E35-L; E35-N; L04-C12A; L04-C14A

☐ L34 ANSWER 4 OF 14 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN

#### Accession Number

2004-167750 [16] WPIX Full Text

#### Title

**Formation of layer of material on a substrate surface comprises chemisorbing alkoxide vapor on substrate surface to form alkoxide layer, and reacting the**

**alkoxide layer with activated oxidant that does not include hydroxyl group.**

**Author/Inventor**

KIM, S T; KIM, Y S; LIM, G B; PARK, I S; YEO, J H; IM, G; KIM, S; KIM, Y; PARK, I; YEO, J

**Patent Assignee/Corporate Source**

(SMSU) SAMSUNG ELECTRONICS CO LTD; (IMGG-I) IM G; (KIMS-I) KIM S; (KIMY-I) KIM Y; (PARK-I) PARK I; (YEOJ-I) YEO J

**Patent Information**

| PATENT NO.           | KIND | DATE     | WEEK      | LA | PG | MAIN IPC    |
|----------------------|------|----------|-----------|----|----|-------------|
| <b>US 2004009679</b> | A1   | 20040115 | (200416)* |    | 27 | H01L021-00  |
| JP 2004056142        | A    | 20040219 | (200416)  |    | 25 | H01L021-316 |
| KR 2004008571        | A    | 20040131 | (200435)  |    |    | H01L021-203 |

**Application Details**

US 2004009679 A1 CIP of US 2002-47706 20020115, **US 2003-615881 20030710**;  
JP 2004056142 A JP 2003-274998 20030715; KR 2004008571 A KR 2002-42217  
20020718

**Abstract**

US2004009679 A UPAB: 20040603

NOVELTY - A layer of material is formed on a substrate surface using **atomic layer deposition** by chemisorbing an alkoxide vapor on the substrate surface to form an alkoxide layer, and reacting the alkoxide layer with an activated oxidant that does not include a hydroxyl group to form the layer of material on the substrate surface.

DETAILED DESCRIPTION - An INDEPENDENT CLAIM is also included for a method of forming a capacitor for a semiconductor device comprising forming a first electrode on a semiconductor substrate, forming a dielectric layer on the first electrode, and forming a second electrode on the dielectric layer.

USE - For forming a layer of material on substrate surface.

ADVANTAGE - The method provides dielectric material that exhibits excellent step coverage and improved leakage current characteristics.

DESCRIPTION OF DRAWING(S) - The drawing shows a graph showing a depth profile of a hafnium oxide film formed according to the inventive method.  
Dwg.5/11

**Technology**

US 2004009679 A1UPTX: 20040305 TECHNOLOGY FOCUS - ELECTRONICS - Preferred Method: The method further comprises chemisorbing a second alkoxide vapor on the layer of material on the substrate surface to form a second alkoxide layer, and reacting the second alkoxide layer with a second activated oxidant that does not include a hydroxyl group to form a second layer of material on the substrate surface. The chemisorbing of the alkoxide vapor on the substrate surface to form an alkoxide layer and the reacting the alkoxide layer with the activated oxidant to form the layer of material on the substrate surface are conducted at 100-500degreesC.

TECHNOLOGY FOCUS - INORGANIC CHEMISTRY - Preferred Components: The material is an insulating material, which can be hafnium oxide, zirconium oxide, **tantalum** oxide, **yttrium** oxide, niobium oxide, titanium oxide, cerium oxide, indium oxide, ruthenium oxide, magnesium oxide, strontium oxide, boron oxide, silicon dioxide, germanium oxide, tin oxide, lead oxide, lead dioxide, vanadium oxide, lanthanum oxide, arsenic oxides (As<sub>2</sub>O<sub>5</sub>, As<sub>2</sub>O<sub>3</sub>), praseodymium oxide, antimony oxides (Sb<sub>2</sub>O<sub>3</sub>, Sb<sub>2</sub>O<sub>5</sub>), calcium oxide, or phosphorus pentoxide. The activated oxidant is ozone, plasma oxygen, remote plasma oxygen, or plasma nitrogen oxide.

TECHNOLOGY FOCUS - ORGANIC CHEMISTRY - Preferred Components: The alkoxide is a

metal or semimetal alkoxide. The metal in the metal alkoxide can be titanium, zirconium, hafnium, germanium, tin, or lead. The alkoxide includes hafnium alkoxide such as  $\text{Hf}(\text{OEt})_4$ ,  $\text{Hf}(\text{OPr})_3$ ,  $\text{Hf}(\text{OBu})_4$ ,  $\text{Hf}(\text{OnBu})_4$ ,  $\text{Hf}(\text{OtBu})_4$ ,  $\text{Hf}(\text{mmp})_4$ ,  $\text{Hf}(\text{OtBu})_2(\text{dmae})_2$ ,  $\text{Hf}(\text{OtBu})_2(\text{mmp})_2$ , or  $\text{Hf}(\text{OSi}(\text{C}_2\text{H}_5))_4$ .

#### Manual Codes

CPI: L04-C01B; L04-C12A EPI: U11-C05B6

#### ☐ L34 ANSWER 5 OF 14 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN

##### Accession Number

2004-223801 [21] WPIX Full Text

##### Title

*Formation of high-k dielectric material layer in integrated circuit by depositing first metal oxide layer using atomic layer deposition with metal nitrate precursor, and depositing another metal oxide layer with a metal chloride precursor.*

##### Author/Inventor

CONLEY, J F; ONO, Y; SOLANKI, R

##### Patent Assignee/Corporate Source

(SHAF) SHARP KK; (SHAF) SHARP LAB AMERICA INC

##### Patent Information

| PATENT NO.    | KIND | DATE     | WEEK      | LA | PG | MAIN IPC    |
|---------------|------|----------|-----------|----|----|-------------|
| US 6686212    | B1   | 20040203 | (200421)* |    | 5  | H01L021-00  |
| JP 2004153238 | A    | 20040527 | (200441)  |    | 10 | H01L021-316 |

##### Priority Application Information

|                |          |
|----------------|----------|
| US 2002-286100 | 20021031 |
|----------------|----------|

##### Abstract

US 6686212 B UPAB: 20040326

NOVELTY - High-k dielectric material layer in an integrated circuit is formed by preparing a silicon substrate (10) including forming an H-terminated surface (16) on the substrate, depositing a first metal oxide layer using **atomic layer deposition** ( **ALD** ) with a metal nitrate precursor, depositing another metal oxide layer using **ALD** with a metal chloride precursor, and completing the integrated circuit.

USE - For forming a high-k dielectric material layer in an integrated circuit, particularly in fabricating metal oxide semiconductor gate dielectric for separating a transistor gate from the channel between the source and drain regions.

ADVANTAGE - Incorporates a combination of precursors to improve the quality of the resulting metal-oxide films, and eliminates the need for an initial low-k interfacial layer while achieving a film with a high dielectric constant. It provides a high-k dielectric layer having low leakage properties.

DESCRIPTION OF DRAWING(S) - The figure shows the structure after deposition of the second or final hafnium oxide layer.

Silicon substrate 10

Field oxide region 12

H-terminated surface 16

First metal oxide layer 18

Another metal oxide layer 20

Dwg.3/3

##### Technology

US 6686212 B1 UPTX: 20040326 TECHNOLOGY FOCUS - ELECTRONICS - Preferred Method: The forming includes exposing the silicon surface to hydrogen fluoride. A first metal oxide layer (18) is deposited using 1-5 **ALD** cycles. It can be deposited

using a hafnium nitrate precursor. Another metal oxide layer (20) is deposited using **ALD** cycles to achieve a desired metal oxide layer thickness. It can be deposited using a hafnium oxide precursor. An initial metal oxide layer having a thickness of 0.1-1.5 nm is deposited. Preferred Property: The another metal oxide layer has a thickness of 3-10 nm.

TECHNOLOGY FOCUS - INORGANIC CHEMISTRY - Preferred Material: The metal oxide can be hafnium oxide (preferably), zirconium oxide, gadolinium oxide, lanthanum oxide, cerium oxide, titanium oxide, **yttrium** oxide, **tantalum** oxide, or aluminum oxide.

#### Manual Codes

CPI: L04-C12A; L04-E01B EPI: U11-C05B2; U11-C05B4

#### ☐ L34 ANSWER 6 OF 14 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN

##### Accession Number

2004-021243 [02] WPIX Full Text

##### Title

***Atomic layer deposition comprises chemisorbing of fragment of precursor material on substrate while not exposing the precursor material to microwave radiation, and exposing the chemisorbed material to microwave radiation.***

##### Author/Inventor

VAARTSTRA, B A

##### Patent Assignee/Corporate Source

(VAAR-I) VAARTSTRA B A

##### Patent Information

| PATENT NO.    | KIND | DATE     | WEEK      | LA | PG | MAIN IPC   |
|---------------|------|----------|-----------|----|----|------------|
| US 2003200917 | A1   | 20031030 | (200402)* |    | 11 | C30B023-00 |

##### Priority Application Information

|                |          |
|----------------|----------|
| US 2002-133947 | 20020425 |
|----------------|----------|

##### Abstract

US2003200917 A UPAB: 20040107

NOVELTY - An **atomic layer deposition** comprises:

(i) chemisorbing of at least a fragment of a precursor material on a substrate (22) within a reaction chamber while not exposing the precursor (14) material to microwave radiation; and

(ii) exposing the chemisorbed material to microwave (26) radiation within the reaction chamber (12).

USE - For depositing an atomic layer used in the fabrication of integrated circuitry.

ADVANTAGE - The method produces a layer with improved quality and properties.

DESCRIPTION OF DRAWING(S) - The figure shows a schematic, cross-sectional view of an apparatus.

Reaction chamber 12

Precursor 14

Substrate holder 20

Substrate 22

Microwave 26

Dwg.1/7

##### Technology

US 2003200917 A1UPTX: 20040107 TECHNOLOGY FOCUS - ELECTRONICS - Preferred

Method: The exposing to the microwave radiation lasts for 0.1-60 (preferably 0.1-10) seconds. The precursor material comprises a component ultimately to be

within a layer on a substrate and jobbed with a group comprising oxygen and carbon. The microwave radiation releases the group comprising nitrogen and carbon from the component. The exposure to the microwave radiation forms a metal oxide from the metal alkoxide. A reactant is flowed into the chamber after the chemisorbing and before the exposure of the chemisorbed material to the microwave radiation. Preferred Component: The precursor material comprises a metallo-organic or metal alkoxide. The chemisorbed material comprises a metal alkoxide.

TECHNOLOGY FOCUS - INORGANIC CHEMISTRY - Preferred Component: The component comprises strontium, barium, titanium (preferably), zirconium, hafnium, niobium, **tantalum**, **yttrium**, lanthanum, praseodymium, gallium, gadolinium, erbium, aluminum, silicon, phosphorus, and/or germanium. The metal alkoxide comprises titanium or zirconium. The precursor material comprises a metal coordinated with a group comprising nitrogen and carbon. The reactant comprises nitrogen. The layer can be titanium nitride layer. The substrate comprises hemispherical grain silicon.

TECHNOLOGY FOCUS - ORGANIC CHEMISTRY - Preferred Component: The precursor material comprises titanium isopropoxide or tetrakis- dimethylaminotitanium. The reactant is ammonia, organic amines, nitrogen, or hydrazine.

#### Manual Codes

CPI: L04-C01; L04-C01A; L04-C01B EPI: U11-C01A; U11-C01B; U11-C09

#### ☐ L34 ANSWER 7 OF 14 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN

##### Accession Number

2002-581746 [62] WPIX Full Text

##### Title

*Purification of metal oxide layer used as capacitive dielectric layer, involves supplying oxidant into chamber provided with substrate having metal oxide layer with contaminants, and irradiating oxidant and oxide layer.*

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##### Patent Assignee/Corporate Source

(IBM) INT BUSINESS MACHINES CORP

##### Patent Information

| PATENT NO. | KIND | DATE     | WEEK      | LA | PG | MAIN IPC   |
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##### Priority Application Information

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| US 2000-694173 | 20001023 |
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##### International Patent Classification

ICM H01L021-31

ICS H01L021-26; H01L021-469

##### Abstract

US 6395650 B UPAB: 20020926

NOVELTY - Purifying metal oxide (MO) layer involves positioning substrate having a MO layer formed of MO base material uniformly distributed with contaminant material (CM) susceptible to react with oxidant to form volatile CM, within reactor chamber, introducing an oxidant into chamber, irradiating MO layer and oxidant with radiation to reduce concentration of

US 6395650 B1 UPTX: 20020926

EXAMPLE - Aluminum oxide dielectric layer of thickness 80 Angstrom was formed on a semiconductor substrate using aluminum tris- hexafluoroacetylacetonate

aluminum source material in conjunction with oxygen oxidant source material, by chemical vapor deposition, with oxidant flow rate of 500 standard cubic centimeters/minute. The semiconductor substrate was maintained at 500degreesC and reactor chamber was at pressure of 5 torr. The nuclear reaction analysis (NRA) of aluminum oxide dielectric layer was performed to control the extent of carbon contaminant in the layer. The layer was irradiated with ultraviolet excimer laser at 22degreesC, using 100 hertz pulsed irradiation. NRA was again performed to determine change in concentration of contaminant material. The carbon contaminant concentration was reduced to 85%. The aluminum oxide base material stoichiometry was not changed. Metal oxide dielectric layer with enhanced dielectric properties and reduced electrical leakage properties, was formed.

#### Technology

US 6395650 B1 UPTX: 20020926 TECHNOLOGY FOCUS - INORGANIC CHEMISTRY - Preferred Substrate: The substrate is employed within fabrication selected from microelectronic fabrication, optical fabrication and decorative fabrication. Preferred Material: The metal oxide base material is selected from silicon oxide, aluminum oxide, zirconium oxide, hafnium oxide, **tantalum** oxide, **yttrium** oxide, titanium oxide, lanthanum oxide, gadolinium oxide, lanthanum-aluminum oxide, zirconium-aluminum oxide, yttrium-aluminum oxide, hafnium-aluminum oxide, titanium-aluminum oxide, barium-strontium-titanium oxide, lead-zirconium-titanium oxide, zirconium-silicon oxide, hafnium-silicon oxide, zirconium oxynitrides, yttrium oxynitrides, hafnium oxynitrides, tantalum oxynitrides, titanium oxynitrides, aluminum oxynitrides, zirconium-silicon oxynitrides, yttrium-silicon oxynitrides, hafnium-silicon oxynitrides, tantalum-silicon oxynitrides and aluminum-silicon oxynitrides. Preferred Contaminant: The contaminant is carbon, sulfur or hydrogen contaminant. The contaminant concentration within the metal oxide layer is decreased during irradiation. Preferred Oxidant: The oxidant is oxygen containing oxidant or halogen containing oxidant. Preferred Metal Source: The metal source material is a metal and carbon containing source material such as organometallic source material, metal alkoxide source material or metal chelate source material. TECHNOLOGY FOCUS - ELECTRONICS - Preferred Radiation Source: The radiation source is an ultraviolet radiation source selected from ultraviolet laser radiation sources, ultraviolet lamp radiation sources and ultraviolet plasma radiation sources. Preferred Method: The metal oxide layer is formed by thermal chemical vapor deposition (CVD) methods, plasma enhanced chemical vapor deposition (PECVD) methods, digital chemical vapor deposition (CVD) methods, reactive sputtering methods, **atomic layer deposition (ALD)** methods and **molecular layer deposition** (MLD) methods. The metal oxide layer is formed by a discontinuous deposition method and the irradiation of the substrate is coordinated with a discontinuity within the discontinuous deposition method.

#### Manual Codes

CPI: L04-C12A EPI: U11-C02B; U12-A02A3; V05-F04E; V05-F05C; V05-F05E5; V05-F08D5

☐ L34 ANSWER 9 OF 14 PCTFULL COPYRIGHT 2004 Univentio on STN

Accession Number

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Title

**METHOD FOR DEPOSITING A COATING HAVING A RELATIVELY HIGH DIELECTRIC CONSTANT ONTO A SUBSTRATE**

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# Patent Information

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## Abstract

A method for depositing a high-k dielectric coating onto a substrate (14), such as a semiconductor wafer, is provided. The substrate is subjected to one or more reaction cycles. For instance, in a typical reaction cycle, the substrate is heated to a certain deposition temperature. Thereafter, in one embodiment, one or more reactive organo-metallic gas precursors are supplied to the reactor vessel (12). An oxidizing gas is also supplied to the substrate at a certain oxidizing temperature to oxidize and/or densify the layers. As a result, a metal oxide coating is formed that has a thickness equal to at least about one monolayer, and in some instances, two or more monolayers. The dielectric constant of the resulting metal oxide coating is often greater than about 4, and in some instance, is from about 10 to about 80.

DETD

Although **atomic layer deposition** has some benefits over prior methods, it also possesses a variety of problems. For example, **atomic**

**layer deposition** provides for very little processing control and, as a result, certain target characteristics of the dielectric coating may not be readily achieved. In addition, because **atomic layer deposition** is limited to one monolayer per reaction cycle, its effectiveness in a production environment may be limited.

. . .  
 invention can be used to deposit a high-k dielectric coating that contains a metal oxide in which the metal is aluminum, hafnium, **tantalum**, titanium, zirconium, **yttrium**, silicon, combinations thereof, and the like. For instance, the method of the present invention can be utilized to deposit a thin. . .

ICM

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ICS

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